

Chapter 17 Driveway & Intersection Design

DRIVEWAY DESIGN OPTION 1

OVERVIEW

Driveway Design

This method of Driveway Design works best for the straight and slightly skewed drives. This method uses a driveway sub-assembly attached to the MainLine template drop in the area of the driveway. This method does not require 2 horizontal and vertical alignments for each driveway. This method displays the driveway in cross sections and the quantity is easily attainable.

- ❶ *A template is always dropped at a 90 degree angle to the centerline. If the template can't locate an edge of the driveway or match point (Figure 17-1) due to the angle of the driveway or the range of the station start or stop, the Driveway Design Option 2 method may be the best option for the driveway.*

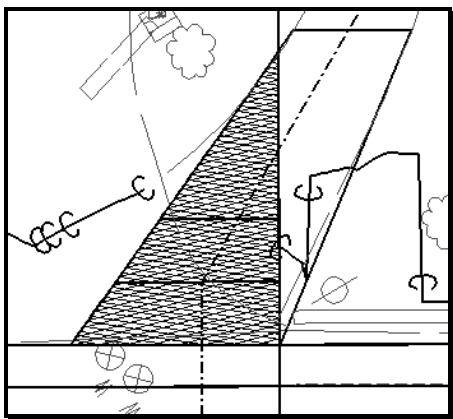


Figure 17-1: Driveway template does not reach the match due to the station of the template drop.

✓ *Refer to page 17-48 for Driveway Design Option 2.*

Simple Side Road Design

The Driveway Design Option 1 method can be used for simple Side Road design. Adjust the slopes of the bumps, pavement and subgrade depths as required based on current standards.

CREATE DRIVEWAY CROSS SECTIONS

Prerequisites

Project Loaded

Final Alignment Design

Corridor Develop w/“Typical” Templates

Superelevation Applied

MainLine Surface Created

Overview

The intent is to place one of the standard driveway cells in plan view at the center of the existing driveway opening. The edges of the driveway defining the width or skew will be modified later. The line in the center of the driveway cell will be used as a guide when defining the station of the custom cross section. A Custom Cross Section is created for each driveway and can be saved and added to as you build the list of “plus stations” in the final cross section development.

Step One: Create a Working Drawing

Select **File>Make Sheetz** from the MicroStation main menu. Create a *No Prefix* drawing called either **Highway_drives** or **Bridge_drives** based on your workgroup.

✓ *Refer to page 1-18 for more information on using the Make Sheetz program.*

Select which reference files you want to display (i.e. alignments.dgn, topo.dgn, text.dgn, rwplan.dgn) as well as the levels in each reference file. You may want to shut off the **Highway** or **Bridge** drawing if one has been created. The *features* for the MainLine will be written to this drawing through InRoads.

Step Two: Display MainLine Surface Features

Set the *Filter* to **Plan Display** and turn on the filter. Select **Surface>View Surface>Features...** from the InRoads menu. Select the **MainLine** surface and click **Apply**.

Step Three: Place Standard Cell in Plan (Perpendicular)

Overview

Cells should be placed by visually locating the center of the driveway. There are ways to accurately locate the center of the existing opening or center as defined by the consistent

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edge, but a simple visual accuracy should be sufficient. To help minimize mouse click, we recommend that you use *AccuSnap* to assist in cell placement.

✓ *Refer to page 2-8 for more information on AccuSnap.*

Part One: Set the Category Scale

Right click the *Settings Manager* and select **Category>Scale** (Figure 17-2).

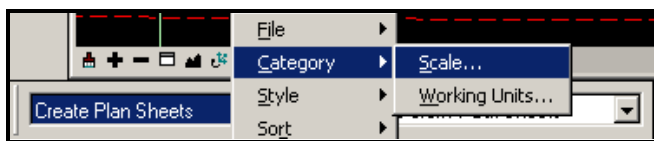


Figure 17-2: Right click anywhere on the Settings Manager and select Category Scale.

Pick the intended scale of the plan drawings (typically 1 in. = 25 ft.) and click **OK** (Figure 17-3).

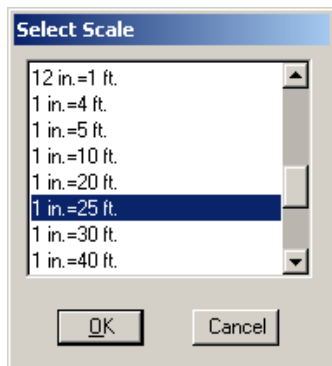


Figure 17-3: Select the intended scale of the plan set.

Part Two: Set Active Depth to “0”

Set the active depth to zero by selecting **Macros>Set/Lock Z** and clicking **OK**.

Part Three: Adjust the Display (Optional)

On project with curbing, you may want to shut off the curb linestyle in order to clearly see the proposed edge of shoulder line where it intersects the existing edge of the driveway or entrance. Select **Settings>Level>Display** from the MicroStation main menu. Right click in the area of the dialog listing the *levels* and select **Off By Element** (Figure 17-4).

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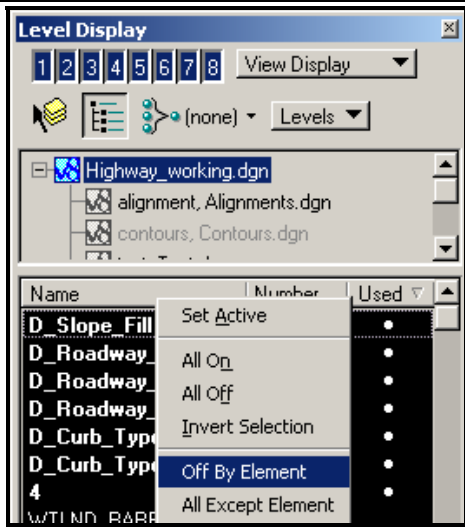


Figure 17-4: Select off by element.

Click on the curb line and any other lines that you'd like to remove from the view while working through this task. Select **File>Save Settings** if you want to come back to this drawing in the future and have these levels turned off then as well.

Part Four: Pick Driveway Scenario

Select the down arrow on the left side of the *Settings Manager* and pick **Driveways**. Now select the down arrow on the right side and select the driveway **Entrance Type (curbed or uncurbed)** that best represents your situation (i.e. Curbed Residential Entrance LT, Uncurbed Commercial Entrance RT) (Figure 17-5).

♪ The width and skew of the driveway can be modified later.



Figure 17-5: The Settings Manager will look like this capture.

There should be a cell on your cursor. You are now prompted for a location of the cell.

Part Five: Place Cell on Curves

♪ To get “focus” in the AccuDraw dialog, hit the ESC key on your keyboard or click in the X, Y or Z fields.

Verify there is focus in the *AccuDraw* dialog. Type “N” to invoke the *Nearest Snap*. Move the cell along the proposed edge of shoulder until you feel it's roughly in the center of the opening. Type “O” for origin. Now type “RQ” to rotate the compass “quickly” around the origin. Type “C” to invoke the center snap. With *AccuSnap* on, simply highlight the centerline and click the left mouse button. Type “RZ” to rotate the driveway 90 degrees and left click the mouse at the center of the *AccuDraw* compass. Right click to *Accept* the placement.

Part Five: Place Cell on Tangents

Verify there is focus in the *AccuDraw* dialog. Type “N” to invoke the *Nearest Snap*. Highlight the centerline. Move the cell along the proposed centerline until you feel it’s roughly in the center of the driveway. Supply a left click. The cell will rotate around the point. Use a “N” snap again and move the mouse up station and left click the centerline.

Part Six: Drop the Cell

Drop the cell with the *Drop Element* tool (Qualities>Drop>Complex (Cell, Chain, etc.)) seen in Figure 17-6. Click on the driveway cell. This separates the cell into the minor parts.

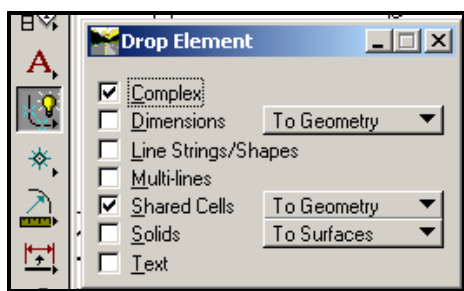


Figure 17-6: *Drop Element* tool in the main tool frame.

Step Four: Place Standard Cell in Plan (Skewed Drives)**Overview**

There are always many ways to do the same thing, so we are outlining two of the easiest ways to get the centerline established for skewed driveways. One way will be to use the standard cell and add a vertex to the driveway centerline minimally at the back of sidewalk, or the first 6’ bump outside of the gutter line and then modify the direction of the end of the line. Another way would be to draw a line perpendicular to the centerline minimally out to the back of sidewalk, or the first 6’ bump outside of the gutter line. When it comes to designing the edges of the driveways with this method, you would draw them in manually.

Part One: Place Driveway Cell in Plan

Place the standard cells as the perpendicular instructions state previously.

Part Two: Drop the Cell

Drop the cell with the *Drop Element* tool (Qualities>Drop>Complex (Cell, Chain, etc.)) seen in Figure 17-7. Click on the driveway cell. This separates the cell into the minor parts.

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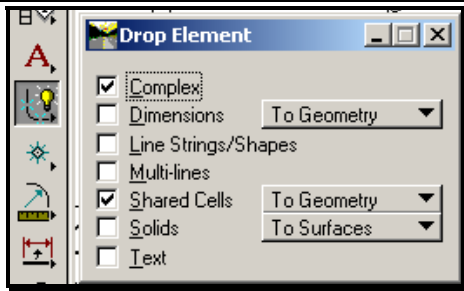


Figure 17-7: Drop Element tool in the main tool frame.

Drives with a Sidewalk

Now insert a vertex (Qualities>Vertex>Add) (Figure 17-8) on the driveway centerline where it intersects the back of sidewalk. Select the centerline of the driveway with a left click and use an “I” – *Intersection* snap to pick the intersection of the centerline and the back of sidewalk. Left click this location to *Accept* the command. This is in order to keep the back of sidewalk bump parallel to the shoulder edge. If the skew doesn’t happen until further away from the roadway, insert it at the best location to keep the centerline in the center of the driveway.



Figure 17-8: Insert Vertex tool in the Modify tool frame.

Use the *Modify* tool (Figure 17-9) to move the end of the driveway centerline to the center of the driveway on the skew. Add additional vertices if necessary.

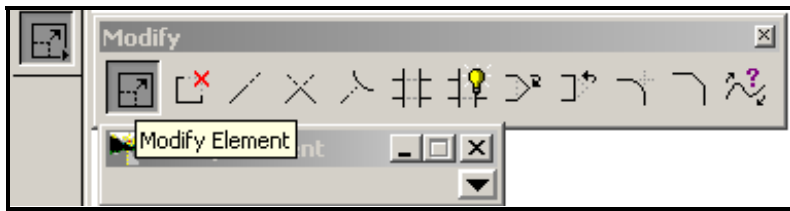


Figure 17-9: The Modify tool located in the Modify tool frame.

Drives without Sidewalk

For non-sidewalk driveways it will take a few more steps. The easiest way to add a vertex would be to utilize *AccuDraw* to insert a vertex minimally 6’ off the gutter line. This is in order to keep the first bump parallel to the shoulder edge. If the skew doesn’t happen until further away from the roadway, insert it at the best location to keep the centerline in the center of the driveway.

Select the *Insert Vertex* tool (Qualities>Vertex>Add) (Figure 17-8). Following the prompts, *Identify Element* by left clicking on it. This will allow you to move the vertex along the line. Use an “I” – *Intersection* snap to place *AccuDraw*’s compass at the intersection of the driveway centerline and the edge of shoulder. Type “O” for “origin” and use the “RQ”

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command to rotate the compass. Snap to the end of the driveway centerline away from the roadway and *Accept* the rotation. Enter the minimum offset of 6' (on tight skews maybe 3' minimally to the paved 3' apron). Left click to *Accept* the location.

Use the *Modify* tool (Figure 17-9) to move the end of the driveway to the center of the driveway on the skew. Add additional vertices if necessary. The result will resemble the screen capture in Figure 17-10.

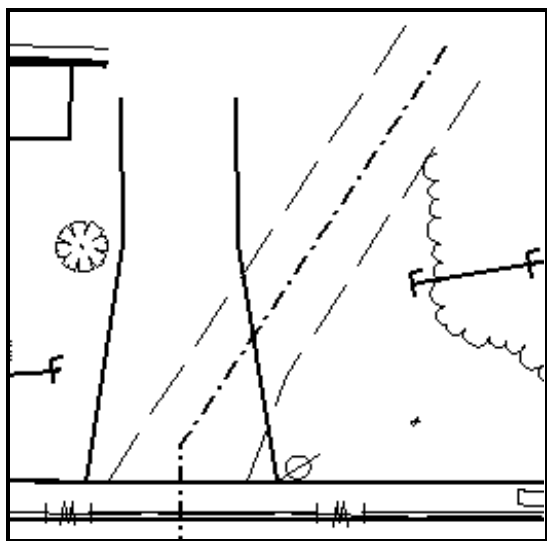


Figure 17-10: Driveway centerline perpendicular to roadway centerline until 3' off the edge of shoulder.

Step Five: Establish Centerline (Manual Method)

🎵 This method will require that you establish the driveway edges manually as well.

Part One: Set Symbology from Settings Manager

Select **Driveways (Plans)>Driveway Centerline** from the *Settings Manager* (Figure 17-11).

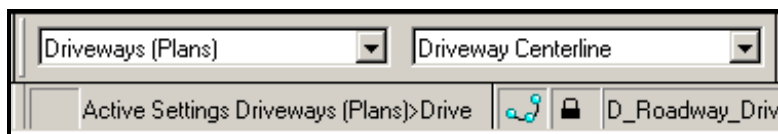


Figure 17-11: Utilize the Settings Manager to place the driveway centerline.

Part Two: Set Snap Mode to Perpendicular

Set the *Snap* mode to **Perpendicular** by adjusting the snap mode on the button bar (Figure 17-12) or by selecting **Settings>Snaps>Perp** from the main menu.

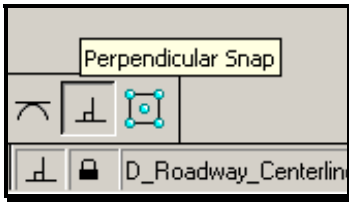


Figure 17-12: Perpendicular snap selected from the button bar.

Part Three: Snap to Centerline

Snap to the centerline of the roadway and *Accept* or with *AccuSnap* move the cursor along the centerline and left click. There should be a line on the end of the mouse dynamically drawing perpendicular from the centerline.

Drives with Sidewalk

Type “N” for the “nearest” snap and left click the back of sidewalk at the center of the driveway. Continue the line adding vertices where necessary staying in the center of the drive.

Drives without Sidewalk

This will require that the AccuDraw compass is also perpendicular to the centerline. Use the “N” shortcut (nearest snap) to decide where the compass should be along the shoulder to represent the center of the driveway and click the “O” shortcut (origin snap). Now use the “RQ” shortcut to “Rotate” the compass “Quick” around its origin. Use the “C” shortcut (center snap) if the centerline is on a curve and snap to the centerline of the road. If on a tangent, snap to another location on the shoulder with an “N” nearest snap. The result will be similar to the example in Figure 17-13.

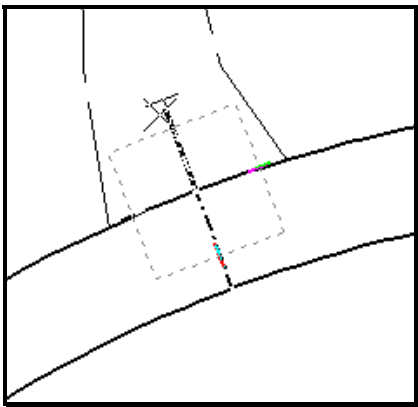


Figure 17-13: Sample of compass rotation perpendicular to roadway centerline.

Enter the minimum distance 6’ beyond the edge of shoulder (on tight skews maybe 3’ minimally to the paved 3’ apron). Left click to *Accept* this distance. The next *Data* point (let click) should be in the center of the driveway on the skew as seen in Figure 17-14. Continue to draw the centerline adding additional vertices as necessary.

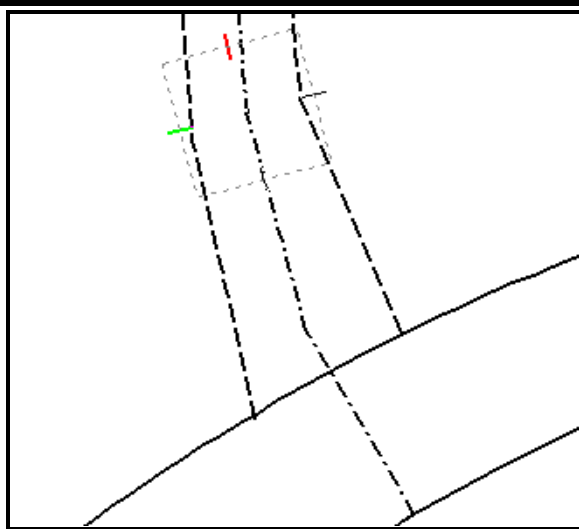


Figure 17-14: Drawing the centerline beyond the perpendicular minimum offset.

Step Six: Create Custom Sections

Overview

This step creates the custom cross sections based on the centerline element of the driveways you created previously. It will be easy to select these globally based on their *Level*. Each of the driveway cells will need to be dropped (Qualities>Drop>Complex) into their finer parts if the haven't been already. You will receive a warning (Figure 17-15) for every cell that hasn't been dropped.

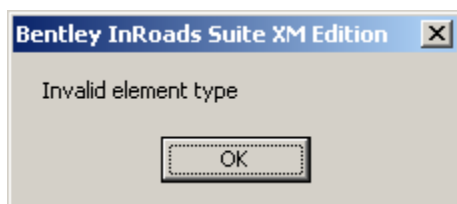


Figure 17-15: Warning if you have some cells that haven't been dropped in the selection set.

✓ *This section is not intended to replace the Custom Cross Section documentation previously outlined. For more details refer to page 20-19*

Part One: Open Cross Section Dialog

Select **Evaluation>Cross Section>Create Cross Section...** from the InRoads menu.

Part Two: Scale and Orientation of Sections

♪ The Cross Section dialog is setup for horizontal Cross Sections at 1" = 5' by default. If another scale or orientation is desired, set it by picking one of the predefined preferences.

Decide on the scale and orientation of the Cross Sections. Sheets can be vertical or horizontal and either at 1" = 5' (1:60) or 1" = 10' (1:120). Use the *Preference* button at

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the bottom of the dialog pick and set the defaults for the Cross Sections pages. Select the preference, click **Load** then **Close** the dialog (Figure 17-16).

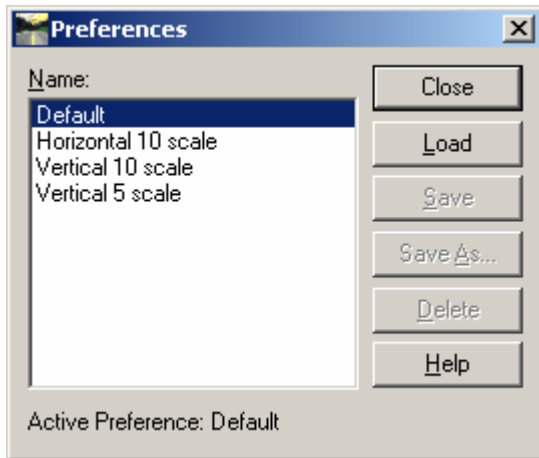


Figure 17-16: Preference dialog for Cross Sections.

Part Three: Set Global Scale Factor

Select **Tool>Global Scale Factor** from the InRoads main menu. Depending on previous step, enter 60 (for Text), 1 (Cell) and 60 (Line Style) for 1" = 5' sections (Figure 17-17) or 120 (for Text), 1 (Cell) and 120 (Line Style) for 1" = 10' sections.

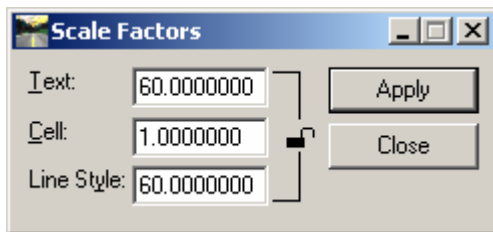


Figure 17-17: Global Scale Factor for 1" = 5' Cross Sections.

Part Four: General Tab

On the *Create Cross Sections* dialog, set the *Surfaces* you want displayed (i.e. Ground and MainLine). Notice the *Left Offset* and the *Right Offset* (Figure 17-18). These same numbers will be used to setup the Custom Cross Section width both sides of the centerline. They can be adjusted if desired. Maximum width of the section is the two widths added together (i.e. 140' for 1" = 5' horizontal).

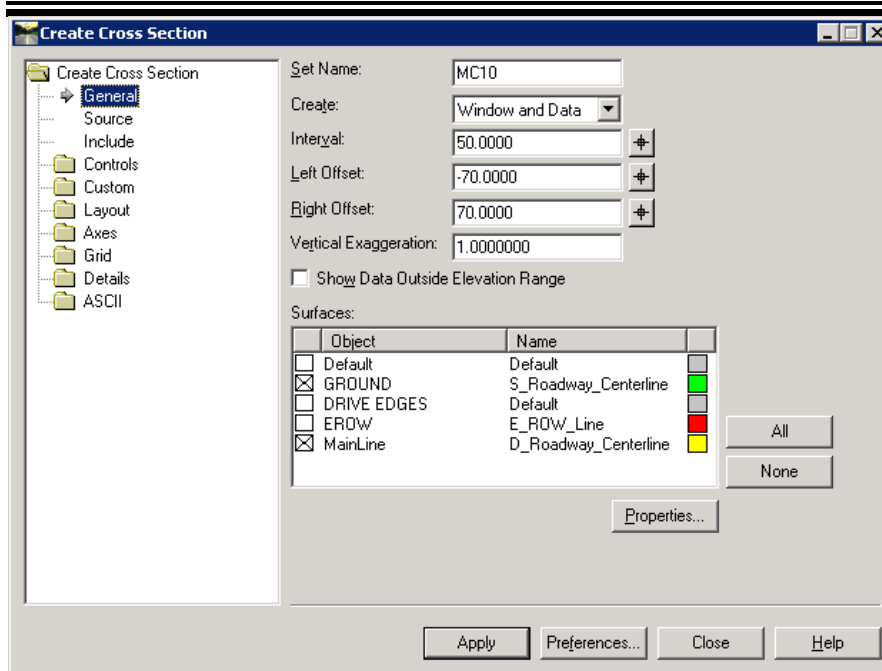


Figure 17-18: General tab of the Create Cross Sections dialog.

Part Five: Select the Controls Leaf

In the *Critical Sections* area of the *Controls* leaf uncheck all options.

Part Six: Select the Custom Leaf

Expand the *Custom* leaf and pick *General* (Figure 17-19).

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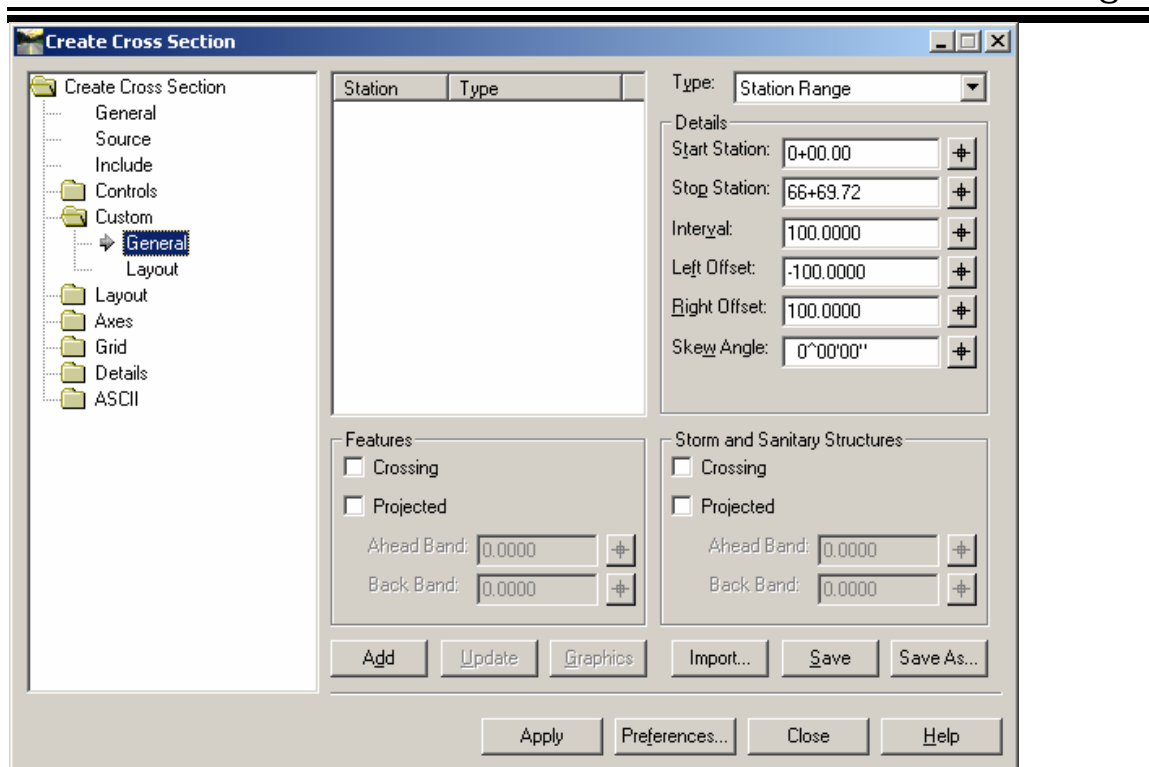


Figure 17-19: Custom Cross Section portion of the dialog.

Part Seven: Power Select Lines

Click on the *Power Selector* tool or activate it from the MicroStation main menu (**Group>Element Selection>PowerSelector**). Click the down arrow on the bottom of the dialog. Select the **Lv** tab. Select the **D_Roadway_Drive_Centerline** from the list of available *Levels* (Figure 17-20).

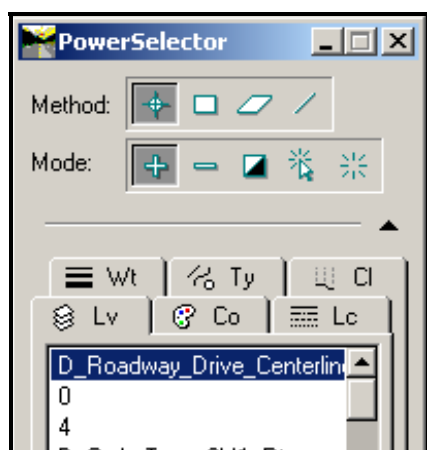


Figure 17-20: Power Selector with the centerline level selected.

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Part Eight: Select the Graphics Button

Once the centerlines have been selected change the *Type* pull down to **Linestring** (Figure 17-21).

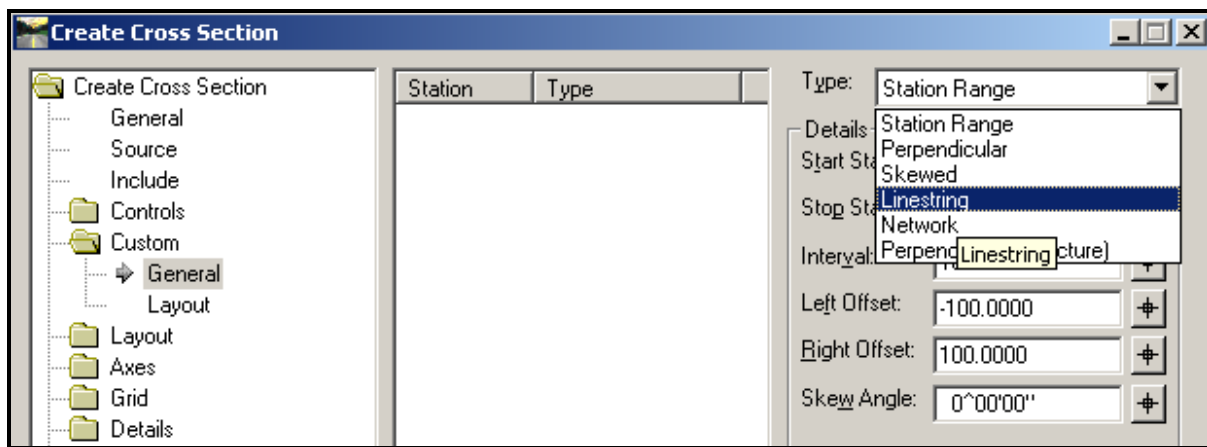


Figure 17-21: Adjust the *Type* pull down to *Linestring*.

The *Graphics* button will now be available. Select the **Graphics** button (Figure 17-22).

🎵 If the *Graphics* button doesn't activate, click in the *Station/Type* area.

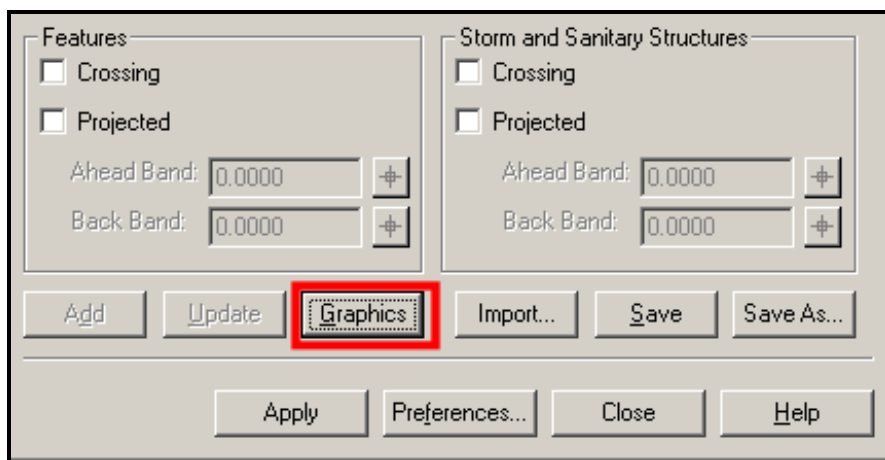


Figure 17-22: *Graphics* button highlights when there are graphics in a selection set.

This will fill in the *Station* and *Type* portion (Figure 17-23) of the dialog with the stations of every driveway centerline you placed.

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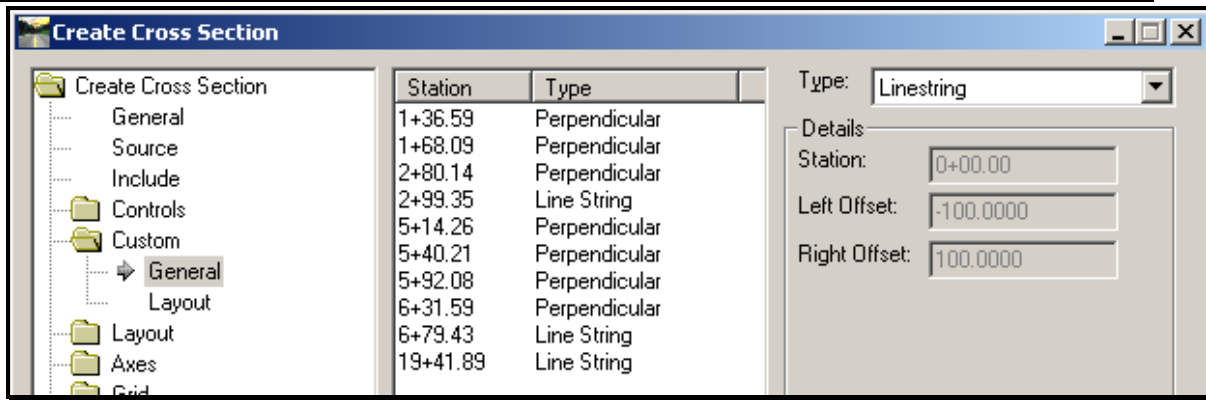


Figure 17-23: Populated Station and Type dialog.

- ♪ This dialog will indicate which of the driveways were truly perpendicular to the centerline, which ones were linestrings (3 point line skewed at edge of apron or back of sidewalk) and which are skewed from the centerline.
- ♪ Depending on whether or not the placements of the cells were truly perpendicular to the centerline, you may receive more skewed sections than you expect. The angle will most likely be minimal and close enough for government work.

Part Nine: Add Crossing Features and Offsets

Highlight all the stations in the list and place a check in the **Crossing** box to display *Crossing Features* in the cross sections in order to display curbing, Existing ROW lines, houses, etc. Click the **Update** button.

- ✓ *Refer to page 20-10 for instructions on adding the Existing ROW lines to the cross sections as a Crossing Features.*

Add the Left and Right offsets to each of the *Perpendicular* and *Skewed* sections based on the *General* tab. Highlight each *Station*, one at a time, add the offsets and select the **Update** button (Figure 17-24).

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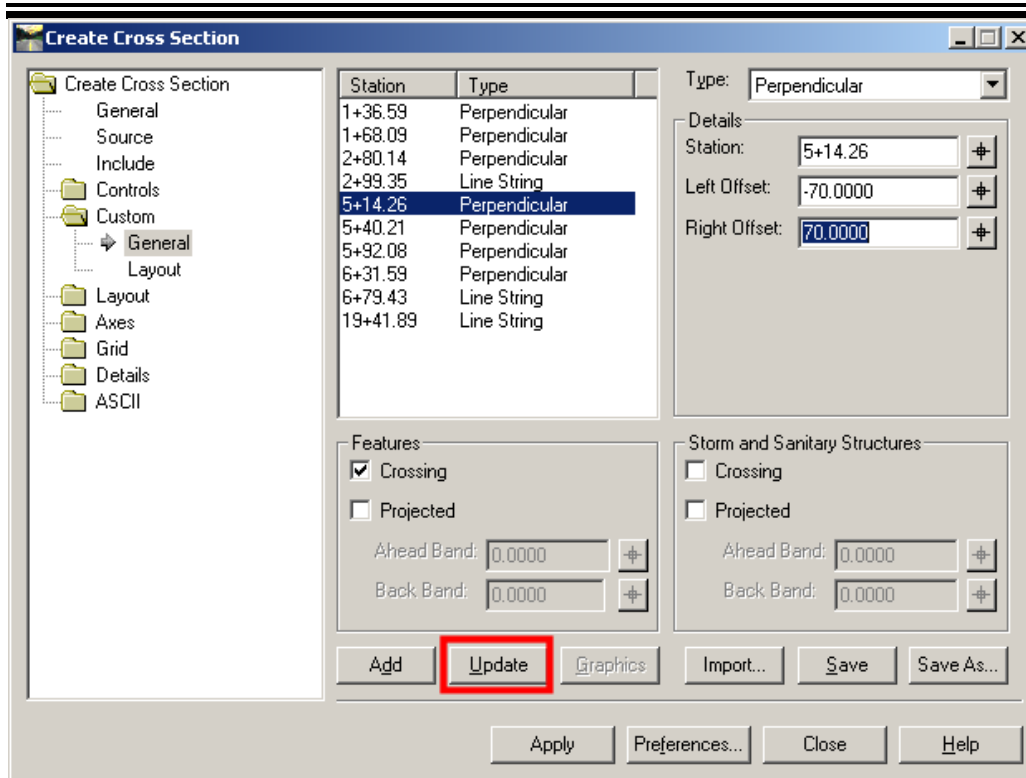


Figure 17-24: Update each Station with the width desired.

In the event you need to match further than the normal width of half of a cross section, adjust the left and right values so that the width necessary is for the side needed. If you go over the maximum width the section will allow, the remainder will be placed as its own section. Cross sections are Left justified, therefore the left half of the cross section will always display with the remainder forced to the next section.

- Linestring sections are based on the length of the line therefore you can't adjust the Left and Right values.

Step Seven: Save the Custom Sections

Select the **Save As...** button on the *Create Cross Sections* dialog (Figure 17-25) and save the custom cross sections. *Station Range* sections can be added later.

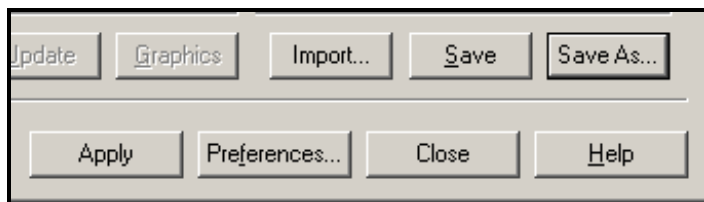


Figure 17-25: Save the Custom Cross Sections and add additional sections later.

Step Eight: Display the Custom Sections

Rotate the view to a **Top** rotation. Zoom out a bit and click **Apply** in the *Create Cross Section* dialog. Left click in the view window to place the sections.

Step Nine: Locking Cross Sections

Power Select (**Group>Element Selection>PowerSelector**) the Cross Sections by placing two left mouse clicks around them and select **Edit>Lock** from the MicroStation main menu. This will lock the cross sections and prevent them from being deleted if the view is ever cleared and also to lock down the existing ground.

ANALYZE DRIVEWAY SECTIONS

Overview

Now you can either *Batch Print* the cross sections and analyze them on paper the old fashion way or do them electronically on the computer. It is recommended that you do this electronically using the following steps.

Step One: Place Driveway Cell

Overview

The standard driveway cells were created from the *Standard Details* to be used as a guide. They display the maximum scenarios. Adjust as dictated by the design guide not to exceed the maximum percentages.

As opposed to using these cells, a user could draw the surface of the drive in each cross section manually using *AccuDraw*.

- ♪ Consider opening a second view window (Window>View>2) and rotating that view to a “Top” rotation so that you can always keep the cross sections handy while being able to rotate the plan view horizontal in the View 1 window.

Part One: Set the Category Scale

Zoom in on the cross section of the first driveway you want to analyze. Right Click the *Settings Manager* and select **Category>Scale** (Figure 17-26).

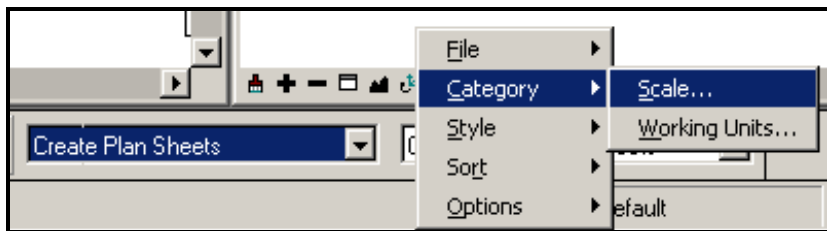


Figure 17-26: Right Click the Settings Manager and select Category>Scale.

This opens the *Select Scale* dialog. Pick the scale that represents the scale of your cross sections. Normally this will be either 1 in. = 5 ft. or 1 in. = 10 ft. (Figure 17-27). Click **OK**.

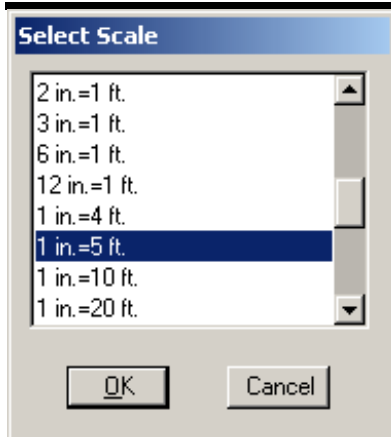


Figure 17-27: Select the scale of your cross sections.

🎵 This will add a scale factor to everything selected from the Settings Manager.

✓ *For more information about the Settings Manager refer to page 2-19.*

Part Two: Select the Cell

Select **Driveways** from the left side of the *Settings Manager*. Select the driveway scenario from the right side of the *Settings Manager* (i.e. Drive Level Left) (Figure 17-28).



Figure 17-28: Select the driveway that best fits the existing slope of the driveway.

Part Three: Place the Cell

Place the driveway cell at the gutter line. There will be a vertex in the shoulder line at this point making it easy to place (Figure 17-29). Depending on the curb type, this will be one foot from the edge of pavement or at the edge of pavement.

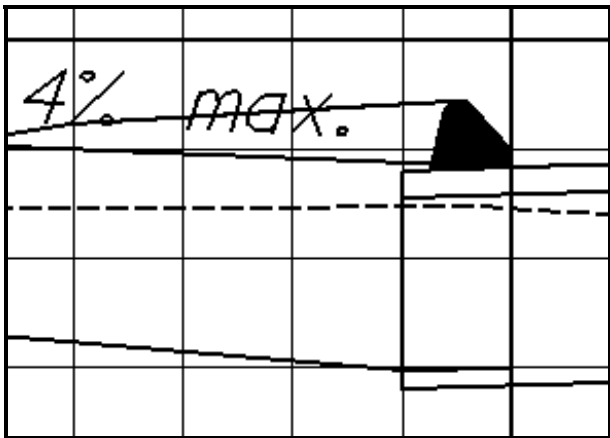


Figure 17-29: Driveway cell place on the gutter line.

Step Two: Manipulate Driveway Cell

The cells can either be *Dropped* and adjusted using the *Modify* tool or left as a cell and manipulated with the *Fence “Stretch”* tool.

Recommended method would be to use a *Fence*. Place a *Fence* (**Group>Fence>Place Block**) around the vertices in the driveway bump. *Stretch* the fence contents by selecting **Group>Stretch Fence** from the MicroStation menu (Figure 17-30). Place a check in the **Stretch Cells** option with the *Fence Mode* set to **Inside**. Stretch the fence contents from the vertex of the bump to the desired location along the existing ground using an “N” nearest snap. Repeat for each vertex you want to move.

♪ If you want to remove a bump, simply move the outer vertex to the previous bump vertex.

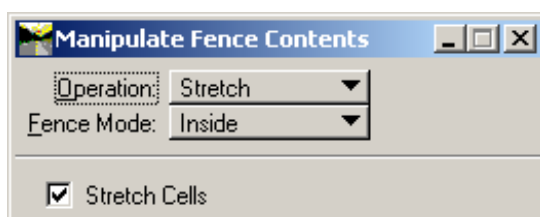


Figure 17-30: Manipulate Fence Contents dialog.

Step Three: Label Proposed Slopes

Load the *Cross Section Settings Manager* by selecting **Settings>DOT SetMgrs> Cross-Sections – Typical**. Select **Prop. Text and Dims>Slope%** from the *Settings Manager*. Left click on the vertex of the segment you want to label nearest the centerline first then select the next vertex furthest from the centerline. This will correctly label a positive or negative slope. Click on the line segment to place the new text (Figure 17-32).

Step Four: Label Existing Slopes

Part One: Set Global Scale Factor

Use InRoads to annotate the existing ground on all of the driveway cross sections. First verify that the *Global Scale Factor* is set to the correct scale of the cross sections. Select **Tools>Global Scale Factor** and set the values to 60, 1 and 60 for normal 1” = 5’ cross sections (120, 1 and 120 for 1’ = 10’ cross sections) (Figure 17-31).

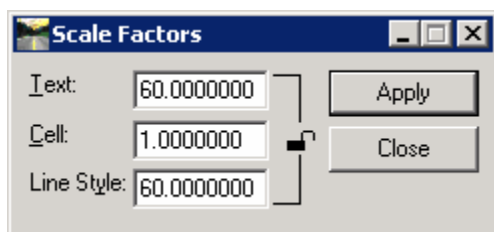


Figure 17-31: Global Scale Factor set up to annotate cross sections.

Part Two: Annotate Cross Sections

To label the slopes for existing ground select **Evaluate>Cross Section>Annotate Cross Section** from the InRoads menu. Select the **Preference** button and select and load the **Existing Drive Grades** preference. Select the **Ground Surface** of the *General* tab. Click **Apply**.

Step Five: Analyze Cross Sections

Check to see if the difference between the slopes are within tolerance or decide whether a design exception is warranted.

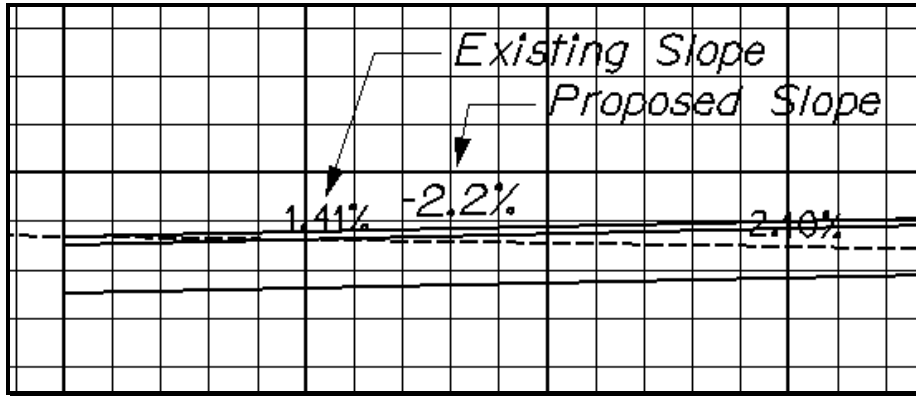


Figure 17-32: Existing and Proposed driveway slopes with percentages labeled.

- ♪ To set a desired slope and determine its match point, it may be easier to draw the line using the *SmartLine* tool and *AccuDraw*. Snap to the last bump, enter in the rough distance in the “X” field of *AccuDraw*. For positive slopes, gesture the mouse above the first point and enter the same distance in the “Y”. Now use *AccuDraw*’s built in calculator to “*” multiply by the desired slope percent (i.e. * .02). Left click to **Accept** this location. Intersect this line with the existing ground.

Step Six: Label Offset

Select **Drafting>Place Cross Section Note** from the InRoads main menu. Select the **Offset** note from the *Proposed* folder within the *Notes Files* (Figure 17-33).

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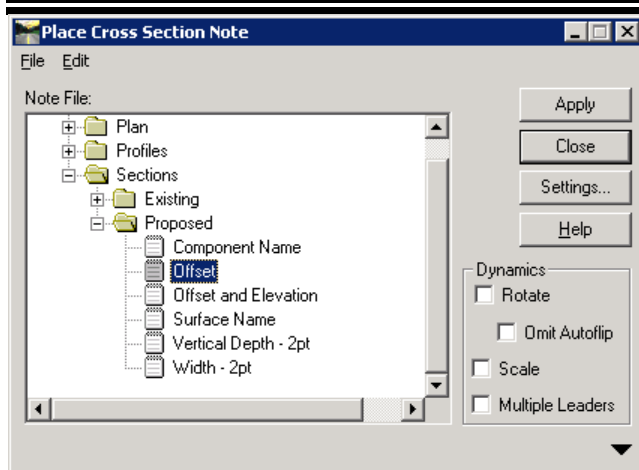


Figure 17-33: Offset note selected from the Proposed folder.

Click **Apply** and place the note by snapping to the intersection of the drive match point and the existing ground. Place the text about the match location (Figure 17-34). Close the dialog.

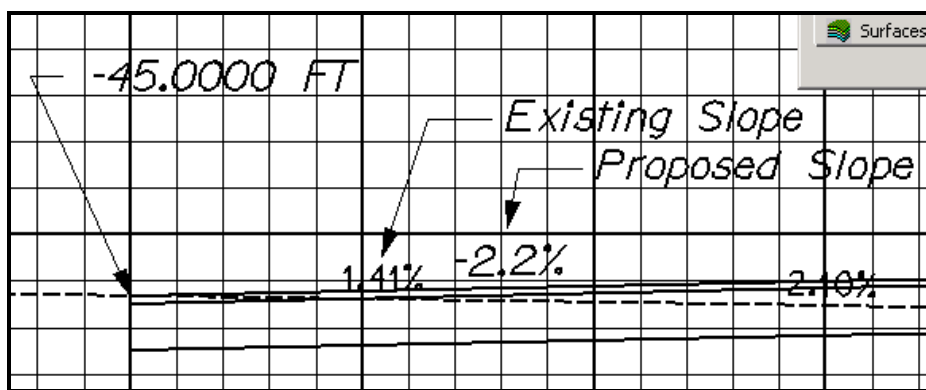


Figure 17-34: Place the offset on the cross section.

Step Seven: Use Tracking to Determine Offset to Match Point (Optional)

Select **Tools>Tracking>Cross Sections** from the InRoads main menu. Snap to the vertex where you matched the driveway. The offset and elevation is reported back at the bottom left of the InRoads dialog (Figure 17-35) as well as the *Message Center* at the bottom of the MicroStation dialog.

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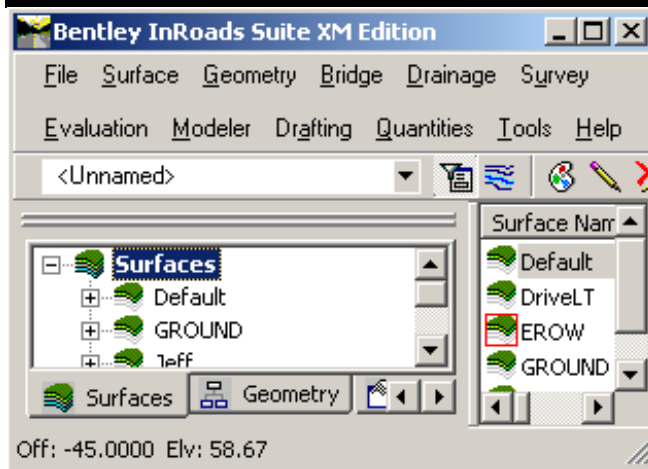


Figure 17-35: Offset and Elevation reported at the bottom of the InRoads dialog.

Step Eight: Lock Cross Sections

In the event you want to clear the display you should now lock the cross sections in order to keep these edits. *PowerSelect* the cross sections and select **Edit>Lock** from the MicroStation main menu.

ADJUST DRIVEWAY EDGES

Overview

This portion of the document will provide some basic tips on how to manipulate the standard driveway edges in the plan view. Another option would be to draw the driveway edges manually using the *Settings Manager* in order to isolate the driveways on the left of the centerline from the driveways on the right. The ultimate goal is to create a *Driveway Edges* surface to utilize the imported features to limit the driveway template on a radius or tapered edge.

In this drawing we will not be concerned with keeping the 3D aspect. When adjusting the radius of the driveway, it will work best if the elements are all on the same plane... elevation "0".

Step One: Adjusting Radial Edges

Overview

The match point on the driveway will determine how the edges are configured as well as the existing shape of the driveway. These instructions will aid in drawing a new standard radius while keeping the standard driveway opening.

Part One: Set the Symbology and Lock Elevation

Select **Driveways** from the left side of the *Settings Manager*. Select the **Driveway Edge Paved Right** (or another selection depending on the driveway) (Figure 17-36).



Figure 17-36: Set the symbology through the Settings Manager.

Lock the elevation by selecting **Macro>Set/Lock Z** from the MicroStation main menu and lock the elevation to "0". This will keep the elements at elevation zero (Figure 17-37).

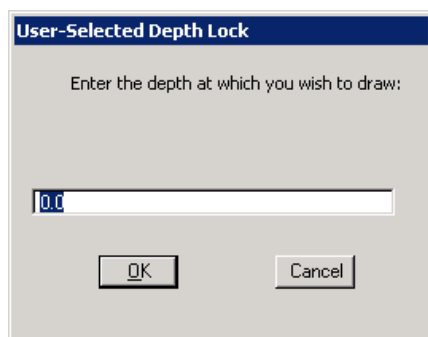


Figure 17-37: Lock the elevation to zero.

Part Two: Copy Parallel Tool

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Select the **Copy Parallel** tool from the main tool box or select **Zip>Parallel>Parallel (New Settings)** from the MicroStation menu. Set the *Mode* to **Original**. Uncheck the *Distance* option and make sure that **Copy** and **Use Active Attributes** are checked (Figure 17-38).

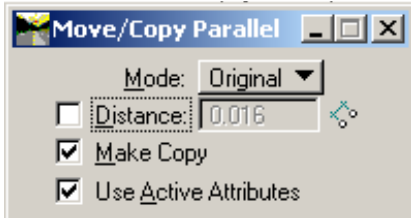


Figure 17-38: Copy Parallel tool settings dialog.

Part Three: Copy Parallel

Use the intersect snap and grab the centerline at the intersection with the driveway centerline. Right click if MicroStation selects the incorrect line initially. Enter the offset to the match point of the driveway by simply gesturing the mouse in the direction and typing the distance. Left click to **Accept** the location (Figure 17-39). Repeat this process to place an additional line with the correct symbology at the proposed edge of shoulder.

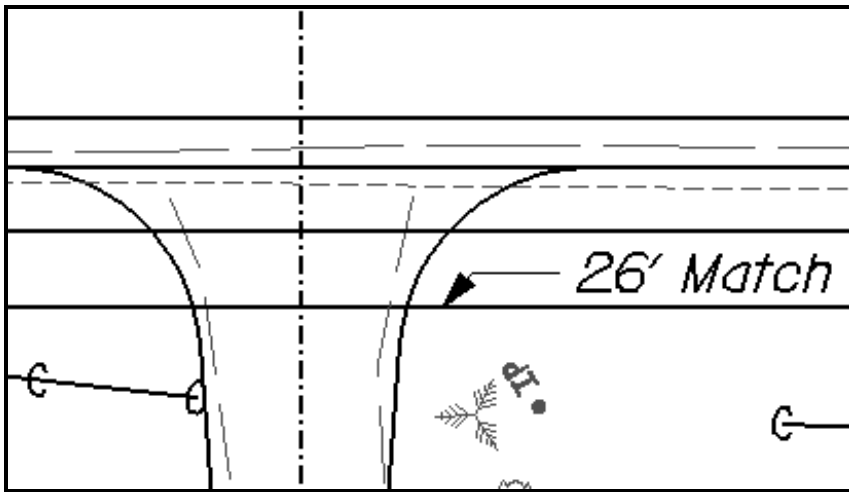


Figure 17-39: Match point copied parallel from the centerline.

Notice in the screen capture in Figure 17-39, that the standard width and radius will not match into the driveway at the specified offset. If you want to keep the radius tangent with the edge of shoulder and the incoming driveway edge, it will be easier to create a new radius using the *Construct Circular Fillet* command.

Part Four: “Trace” Existing Drive Edge

Use the *Place SmartLine* tool to draw on top of the existing driveway edge (Figure 17-40) where it intersects with the match line.

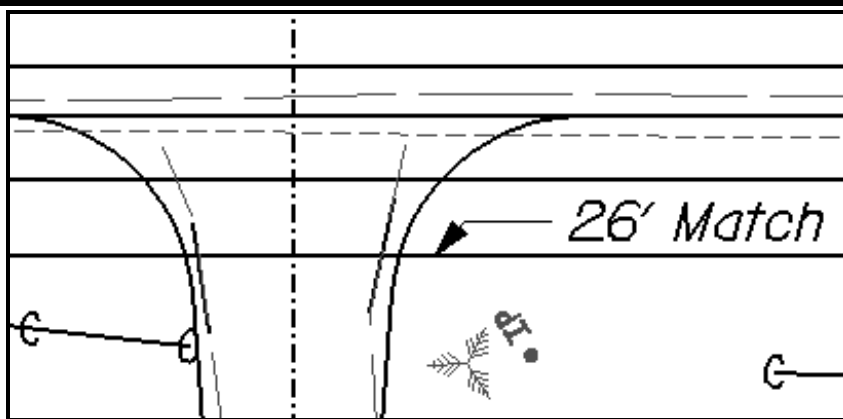


Figure 17-40: Line segment crossing the match line.

Part Five: Delete Partial

Use the *Delete Part on an Element* tool (**Stretch>Delete Partial** from the MicroStation main menu) and delete a small portion of the line you copied parallel onto the shoulder (Figure 17-41).

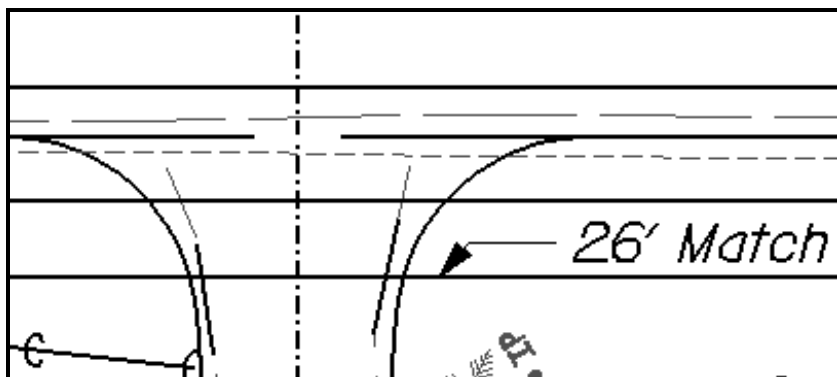


Figure 17-41: Small segment of the drive opening deleted.

- ♪ To make it easier to hit the correct line, temporarily shut off the **D_Roadway_Edge_Shoulder Level**.

Part Six: Construct Circular Fillet

Select the *Construct Circular Fillet* tool or by selecting **Zip>Fillet/Chamfer>Fillet** from the MicroStation menu. Set the radius to 15. Set *Truncate* to both. Concentrating on one edge at a time, left click on the new proposed driveway edge you traced (#1) and then left click on the broken segment representing the edge of shoulder line (#2) (Figure 17-42). Repeat for the other side of the drive.

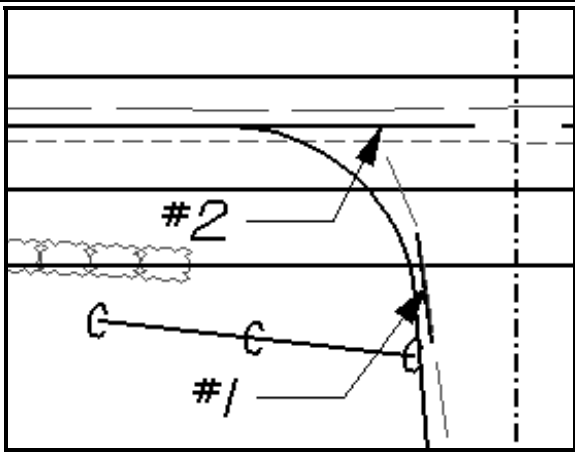


Figure 17-42: Segments to Construct Circular Fillet with.

- ♪ If this doesn't work and MicroStation reports that the elements aren't "planer", select **Macros>Flatten** from the MicroStation menu.

Now use the **Extend 2 Elements to Intersection** tool or select **Stretch>Clip at Intersection** from the MicroStation menu to intersect the back of driveway with the new radius just drawn. Delete any remnants of the standard cell that was placed originally as well as the copied centerline at the edge of shoulder. Results of the circular fillet, intersected lines and cleaned up lines are shown in Figure 17-43.

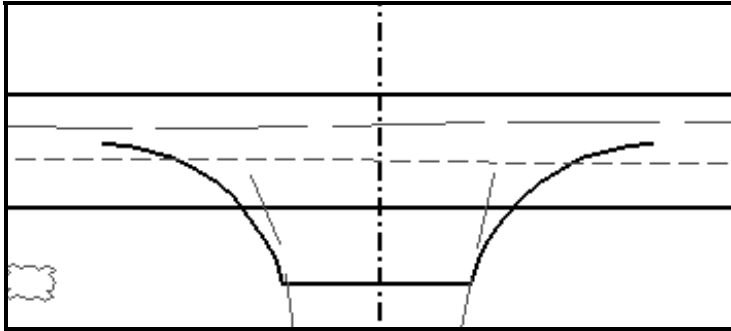


Figure 17-43: Results of the driveway all cleaned up.

Part Seven: Create Complex Chain

Select the *Create Complex Chain* tool or select **Group>Grouping>Create Chain** from the MicroStation menu, set *Mode* to **Manual** and click lines in the "up station" order. Left click to complete the command.

Step Two: Straight Drive Edges

Part One: Wide "Curbed" Drives

Use the intersect snap and grab the centerline at the intersection with the driveway centerline. Right click if MicroStation selects the incorrect line initially. Enter the offset to

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the match point of the driveway by simply gesturing the mouse in the direction and typing the distance. Left click to **Accept** the location.

On drives wider than the standard width, use the *Move Element* tool to move the driveway edge along the edge of shoulder with an “N” nearest snap or use the “T” intersect snap and intersect the existing drive edge where it meets the shoulder line. For driveways on a curve it may be easier to draw a new driveway edge while using the *Perpendicular* snap to make sure of perpendicular connectivity to the edge of shoulder.

Use the *Modify Element* tool to manipulate the end of the line or middle of a line segment to match the existing driveway edge. Use the *Insert Vertex* tool to add a vertex if necessary.

Part Two: Narrow “Curbed” Drives

Use the intersect snap and grab the centerline at the intersection with the driveway centerline. Right click if MicroStation selects the incorrect line initially. Enter the offset to the match point of the driveway by simply gesturing the mouse in the direction and typing the distance. Left click to **Accept** the location.

Use the *Modify Element* tool to move the midpoint of the line beyond the taper to the existing driveway edge. Use the “N” nearest snap to make connectivity. Use the same tool to modify the end of the driveway.

♪ Depending on the offset of the match point, the driveway edge may have to be tweaked to match sooner.

Part Three: Intersect Edges with Match

Now use the **Extend 2 Elements to Intersection** tool or select **Stretch>Clip at Intersection** from the MicroStation menu to intersect the back of driveway with the edges. Delete any remnants of the standard cell that was placed originally.

Part Four: Create Complex Chain

Select the *Create Complex Chain* tool or select **Group>Grouping>Create Chain** from the MicroStation menu, set *Mode* to **Manual** and click lines in the “up station” order. Left click to complete the command.

IMPORT DRIVEWAY EDGES INTO SURFACE

Overview

The goal is to import the driveway edges (which are complex chains) into a new surface so that the template can use the *Features X Y* to control the driveway's offset. They can be imported all at once using pre-established rules through the *Import Surface Advanced* tool.

Step One: Import Edges

Overview

It depends on the order in which you drew the edges that will control the sequence of the incremental *Seed Name* (which is no big deal). The importing will group all left and right drives whether paved or gravel which won't affect the final outcome.

Import Surface Advanced

Select **File>Import>Surface Advanced...** from the InRoads main menu (Figure 17-44). Enter **DRIVE EDGES** as the *Surface*, *Load From* should be set to **All** and the *Intercept Surface* should be set to your **MainLine** surface in order to get the edges close to the correct elevation. Pick the **DRIVE EDGES** rule from the *Rule Set - Name* pull down. The rules have been predefined and shouldn't need manipulation. Click **Apply**.

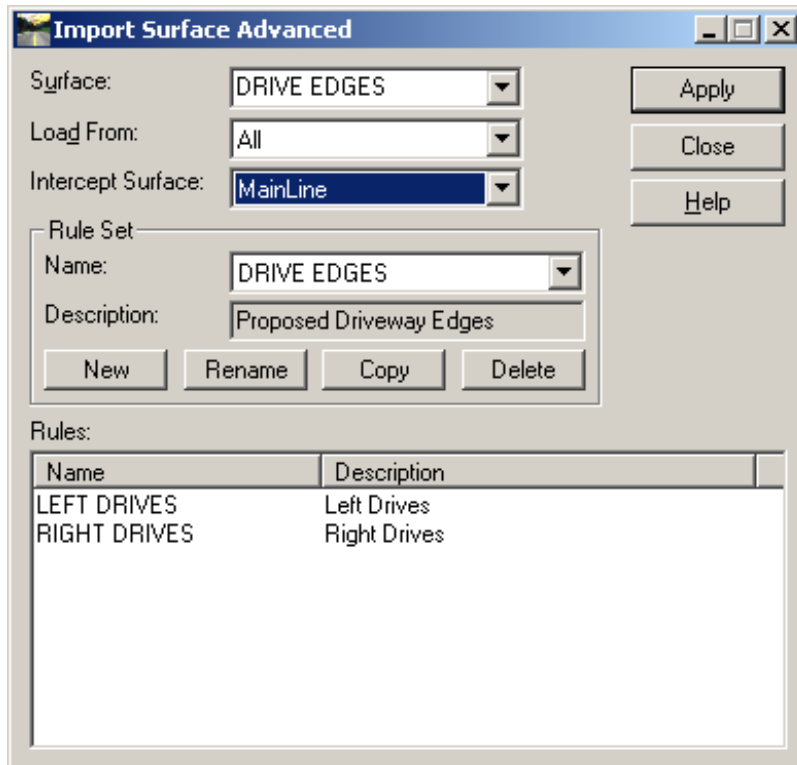


Figure 17-44: Import Advanced dialog set to import left and right driveway edges.

A new *Surface* was created with each complex chain its own feature in the surface.

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Step Two: View Results

Clear the display by selecting the area around the roadway and selecting the *Delete Element* tool. **Do not** delete the Cross Sections with the adjustments to the slopes.

♪ If you've locked the sections previously, select **Edit>Select All** and select the *Delete Element* tool.

Select **Surface>View Surface>Features** (Figure 17-45). Click **Apply** and then **Close**. Verify that the *Feature(s)* completely define the driveway edges.

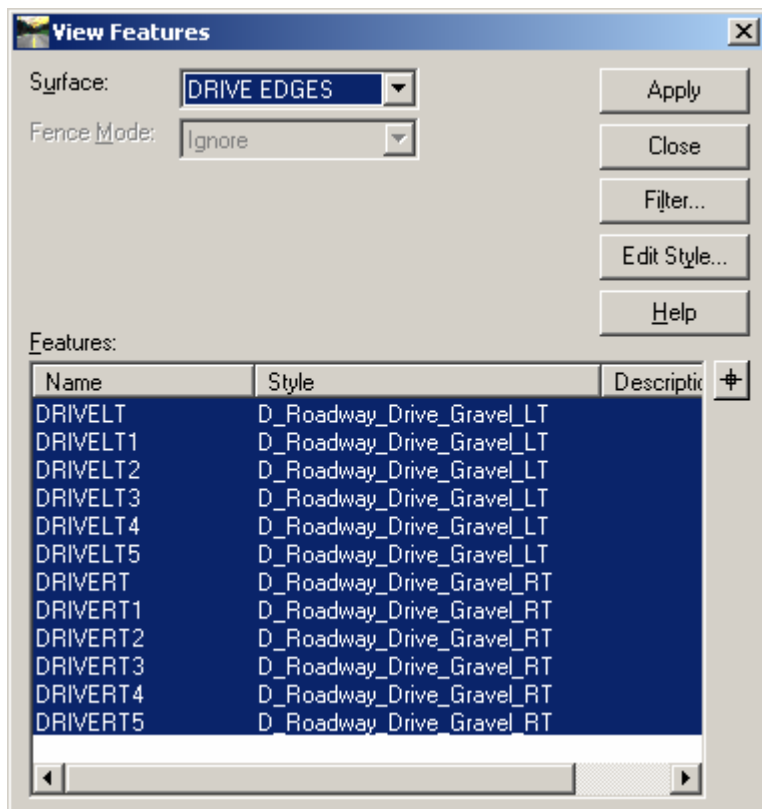


Figure 17-45: View Features dialog with driveway edges.

ADJUST DRIVEWAY TEMPLATES TO REFLECT SECTIONS

Overview

A driveway template will need to be developed for each driveway. This will be done as an edit in the *Template Drop* dialog for the start specific station. The driveway will not reside in the *Template Library*, instead, the edit will reside in the project's IRD specific only to this project. Never synchronize these templates back to the *Template Library*. This is fine due to the fact all driveway edits are only specific to that station range.

Step One: Open MainLine Corridor

Part One: Open Roadway Modeler

Select **Modeler>Roadway Designer...** from the InRoads menu. Open the **MainLine** corridor if not already loaded.

Part Two: Set the Active Surface to Ground

Set the *Active Surface* to **Ground** if not already set (Figure 17-46).

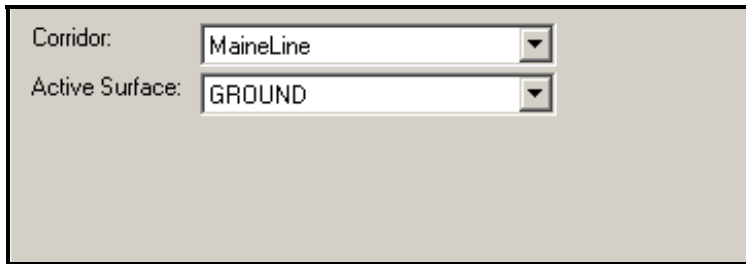


Figure 17-46: Corridor set to MainLine and Active Surface set to Ground.

Step Two: Open Template Drop Dialog

Select **Corridor>Template Drops...** from the InRoads menu.

Step Three: Identify Driveway Start Station

Part One: Highlight the Template Drop

Select the *Template Drop* nearest the location of the driveway that best represent the typical in the area of the driveway if you have multiple templates on the project.

- 🎧 It is important to select this template now otherwise if you select it after you define the beginning driveway station, you will have to repeat this next step.

Part Two: Select the Target Tool

Hold the **Ctrl** key on your keyboard and click the *Target* tool (Figure 17-47). This will allow you to pick the start station of the driveway from the MicroStation graphic.

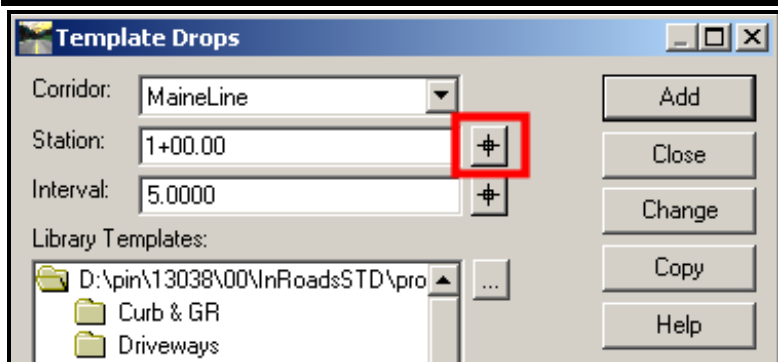


Figure 17-47: Hold CTRL key and click the Target tool.

Part Three: Snap to Beginning of Drive

Snap to the intersection of the driveway edge and the gutter line (Figure 17-48) with an “I” intersect snap. **Accept** the location with a left click.

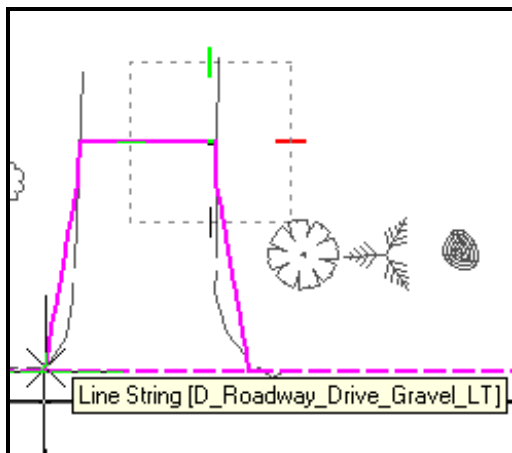


Figure 17-48: Snap and Accept the intersection of the driveway and gutter line.

Step Four: Add the Driveway Template Drop

Part One: Adjust Interval

Set the *Interval* of the drop to 5' as seen in Figure 17-47.

🎵 In some cases a 2' or even a 1' interval may give better results.

Part Two: Copy Previous Template

Select the **Copy** button (Figure 17-47). This will copy the previous template to the new station which will be displayed in the list of *Current Template Drops* (Figure 17-49).

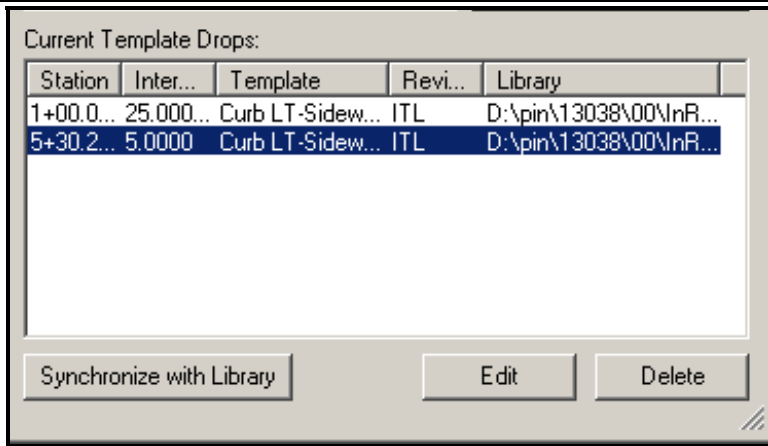


Figure 17-49: Driveway added to the Current Template Drops portion of the dialog.

Step Five: Edit the Roadway Template Drop

Part One: Highlight and Select Edit

Highlight the driveway *Template Drop* and select the **Edit** button.

Part Two: Delete Unnecessary Components

Right click in the gridded area away from all elements in the view and select **Delete Components** (Figure 17-50).

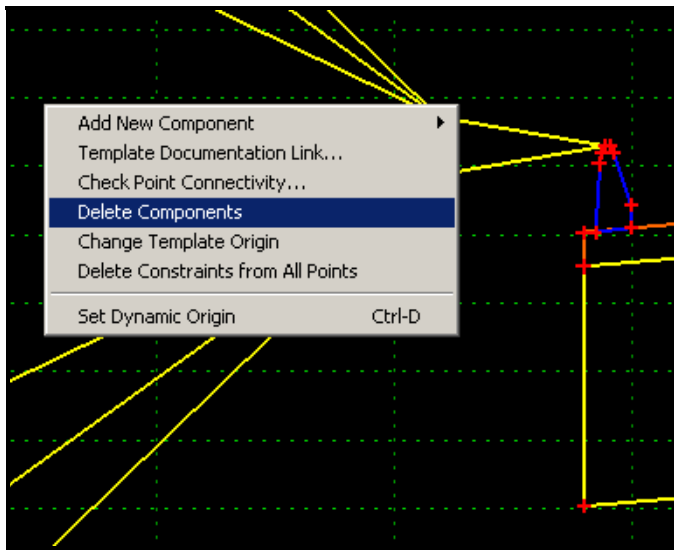


Figure 17-50: Right click in the grid away from all elements in the view and select Delete Components.

Draw a line across the slope end conditions and curb component.

Part Three: Prepare for Driveway Template

Different templates will require different adjustments. This step will require that you make

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the gutter line (ES point) the furthest point away from the centerline in the template (Figure 17-51). Brief descriptions of the edits depending on the scenario are listed below.

Bituminous Curb

In this case, edit the ESH point and adjust the *Horizontal* offset to zero. Click **Apply**. Right click the CG point, select *Merge* and pick the ES point.

Granite/Concrete Curb

Delete the extended subgrade component underneath the curb. Right click the CG1 or CG2 point, select *Merge*, pick the ES point and then click **Apply**.

Sidewalks

Delete the sidewalk components and point SW1 on bituminous curb or the FC1 point on concrete or granite curb. Depending on the curb type, do one of the previous edits.

Daylight Section

Edit the SS point and change the *Vector Offset* that holds the point to the ES and IF to a *Horizontal* constraint of zero to the ES point.

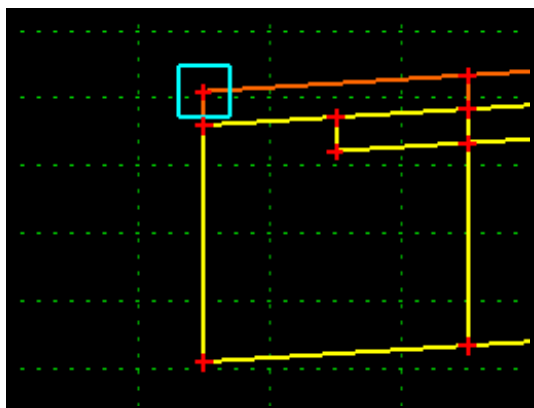


Figure 17-51: MainLine template prepared for driveway template.

Step Six: Place and Edit Driveway Template

Expand the *Template Library* tree and expand the *Driveway* folder. Select the driveway scenario that best represent your driveway situation (i.e. Paved Drive LT).

Part One: Place Driveway Template

Select **Tools>Dynamic Settings** from the InRoads menu and shut off the **Apply Affixes**.

Drag and release the template on the gutter line point when the point is displayed in white.

Part Two: Edit Drive Subgrade

Delete both constraints on the driveway subgrade point at gutter line (i.e. DP2_L or DP2_R) by right clicking the point and selecting **Delete Both Constraints**. Right click this point

again and select **Move**. Move this point and release it on the SS point (or outermost point of the subgrade through the main line template). Right click the point and select **Merge**. Pick the DP2 point (Figure 17-52).

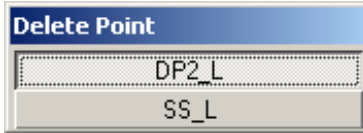


Figure 17-52: Merge the DP2 point leaving just the SS point.

Part Three: Adjust Slopes and Offset

This step consists of editing the points so that the driveway template reflects the cross section edits that were made previously. It may consist of deleting a portion of the template depending on the match point and adjusting slopes.

Edit the top most point and adjust as necessary. In this example (Figure 17-53), we deleted the last bump components. Now we'll edit point B3P and adjust the *Slope* constraint to 2.2% and the *Horizontal* constraint to -45' from point **MC** according to the edits done previously to the cross section. Also, make sure that if this is the furthest point from centerline that the *End Condition is Infinite* is now checked. Click **Apply**.

Now adjust the *Slope* constraint to a **Project to Surface** constraint, **Any Direction** and set the *Surface* to **Ground** and then click **Apply** and then **Close**.

- ♪ Adjusting the slope of the last bump isn't absolutely necessary because the *Project to Surface* will connect at that slope at that specific station. It just better represents the template in the dialog.

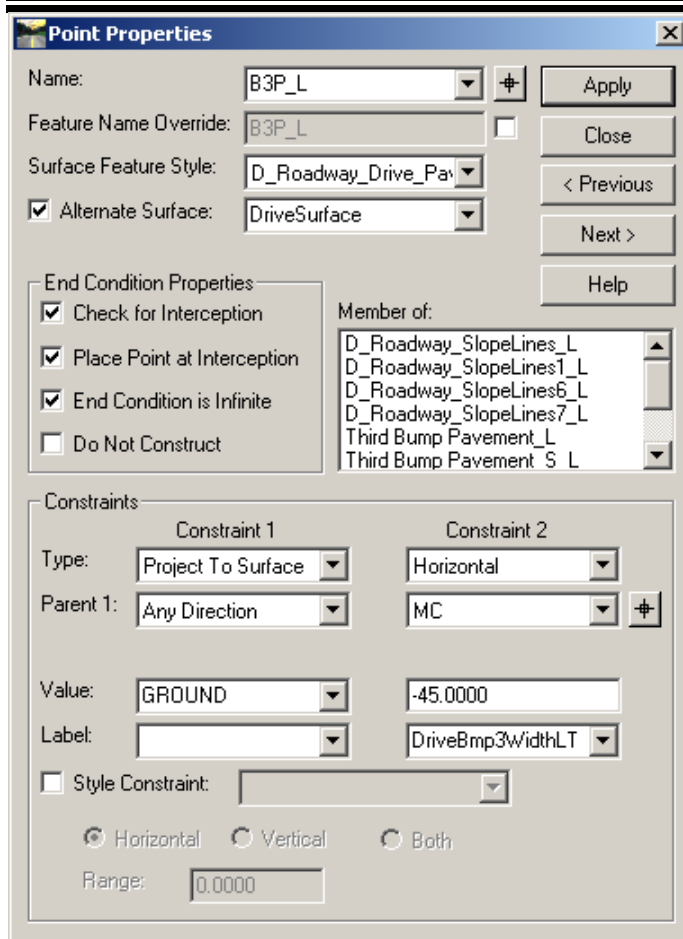


Figure 17-53: Adjustments made to bump point B3P.

The results are shown in Figure 17-54.

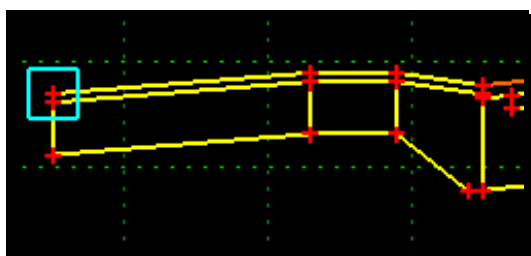


Figure 17-54: Results of the adjustments.

Part Four: Add End Conditions

Expand the *End Conditions* folder of the *Template Library*. Select the **Drives Cut-Fill** end condition and place it at all the bump points that may contact the edge of the driveway (Figure 17-55). The *End Condition* will place either a 4:1 or 3:1 slope. Adjust as necessary.

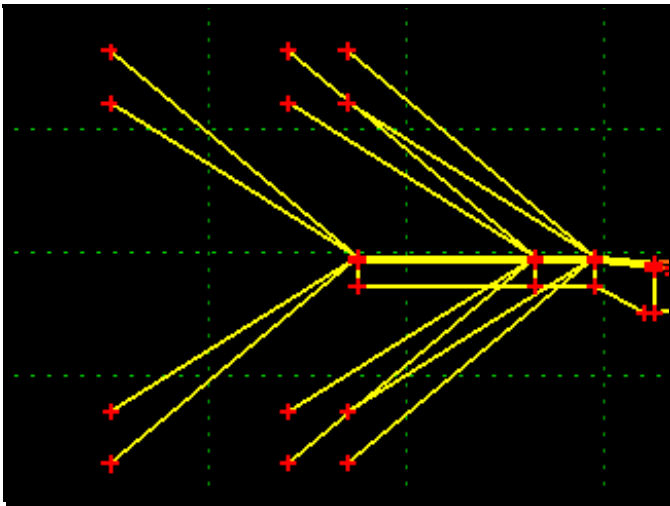


Figure 17-55: Driveway end conditions added to template.

Part Five: Edit Surface of Drive

In Plan View, get information on the driveway feature in the area of the driveway. Depending on your settings, a *tentative snap* will reveal a lot of information about the feature. Note the *Name* of the feature (i.e. DRIVELT) (Figure 17-56).

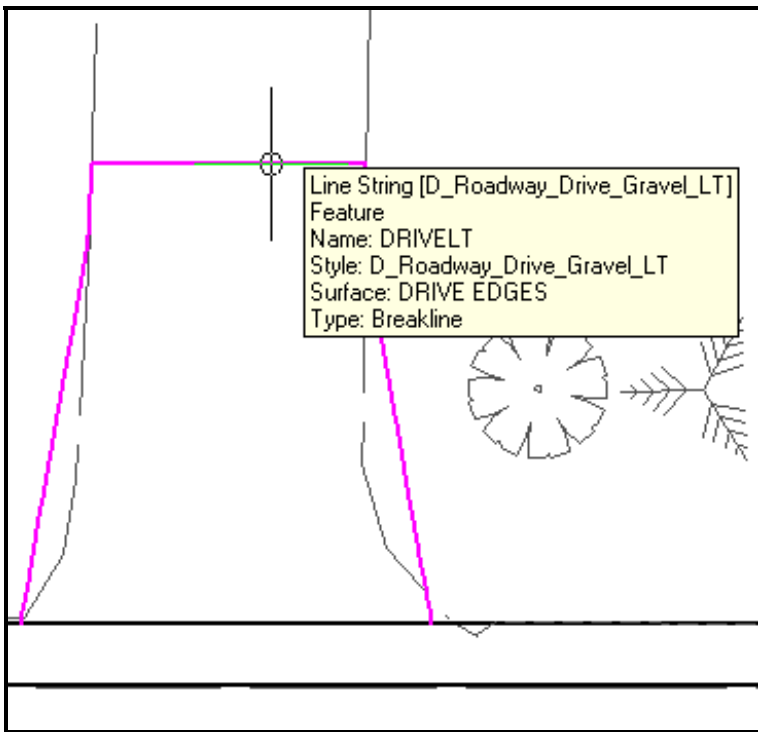


Figure 17-56: Information revealed by a tentative snap.

Double click the surface of each of the driveway bumps (between the points) and edit the **First Bump (_L or _R)** through **Fifth Bump (_L or _R)** components only) (Figure 17-57). These are *End Conditions* that drive the pavement and subgrade components.

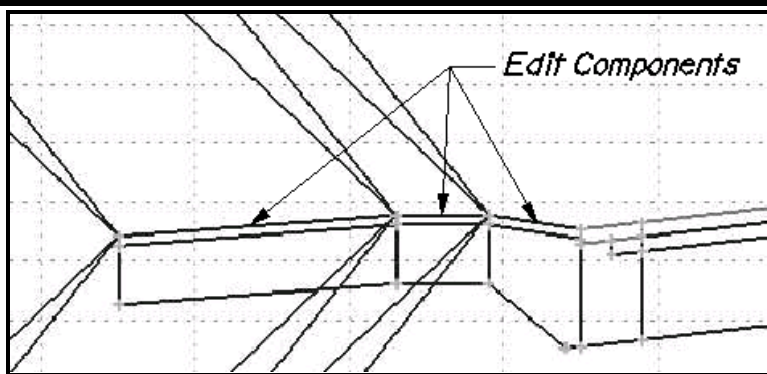


Figure 17-57: Edit bump components labeled here.

In the *Components Properties* dialog (Figure 17-58), set the *Target Type* to **Feature XY**, set the *Surface* to **DRIVE EDGES** and set the *Feature* to the name of the feature for the drive edge in question (i.e. DRIVELT). **Apply** the change to each of the components.

- ♪ When you get a list of components and the one you want to edit isn't in the list, hit the ESC key to see other components.
- ♪ If you removed a bump or two, edit the remaining bumps. Sidewalks do not have *End Conditions* for the first two bumps. Ignore them.

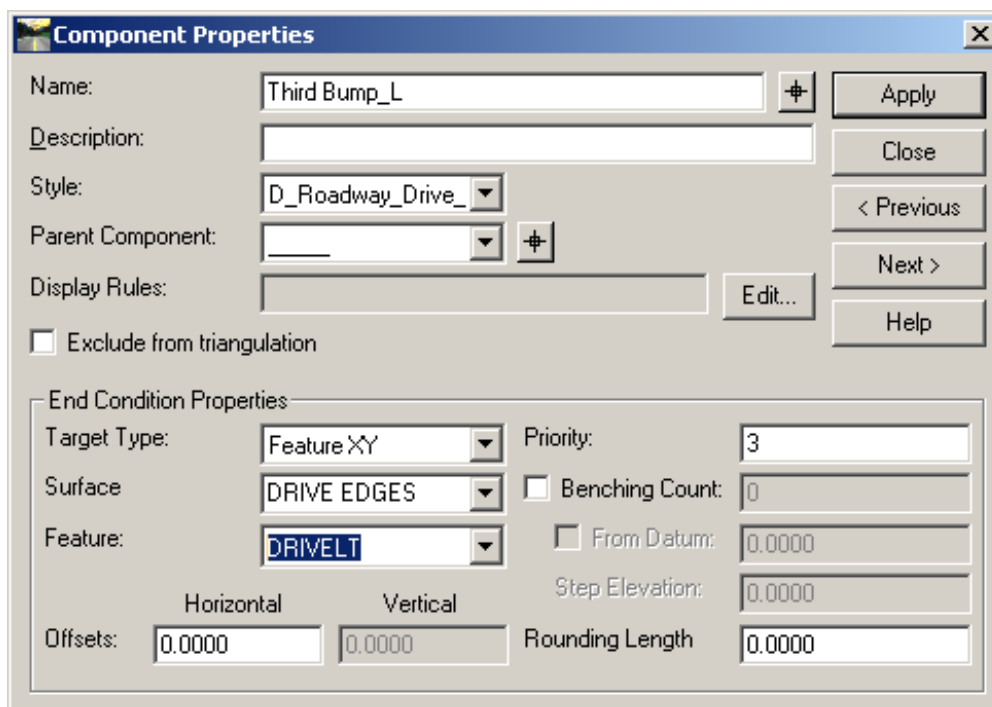


Figure 17-58: Component Properties of the End Conditions to be adjusted.

Part Six: Repeat for All Drive Templates

Do this same process for all of the driveway templates with each specific DRIVE EDGE feature for the station range.

Part Seven: Save IRD

The MainLine corridor should now contain all driveways as well as the main line templates. Save the projects IRD by selecting **File>Save** from the *Roadway Designer* menu.

Step Seven: Process and Review

Part One: Display DRIVE EDGES

To aid in the review of the design, display the proposed DRIVE EDGES in the *Roadway Designer* plan area by selecting **Corridor>Display References...** from the *Roadway Designer* menu. Set the *Surface* to **DRIVE EDGES** and the *Filter* to **DRIVE EDGES** and click the **Add** button (Figure 17-59). To include the existing drive edges, set the *Surface* to **GROUND** and set the *Filter* to **ENTRANCE EDGES** and click **Add**. Close the dialog.

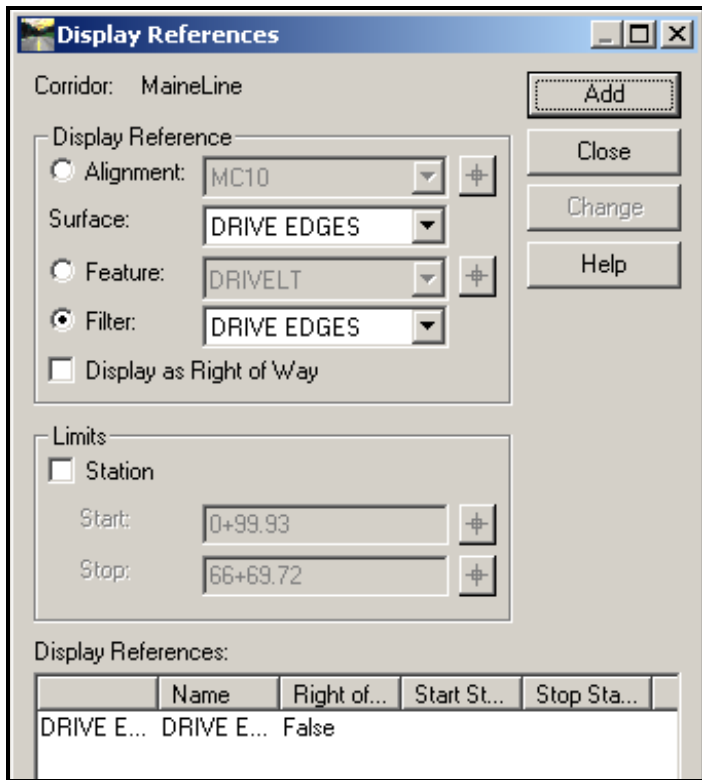


Figure 17-59: Display References dialog set to display the DRIVE EDGES.

Part Two: Process All

Set the *Corridor* to **MainLine** and the *Active Surface* to **GROUND** and select the *Process All* button (Figure 17-60).

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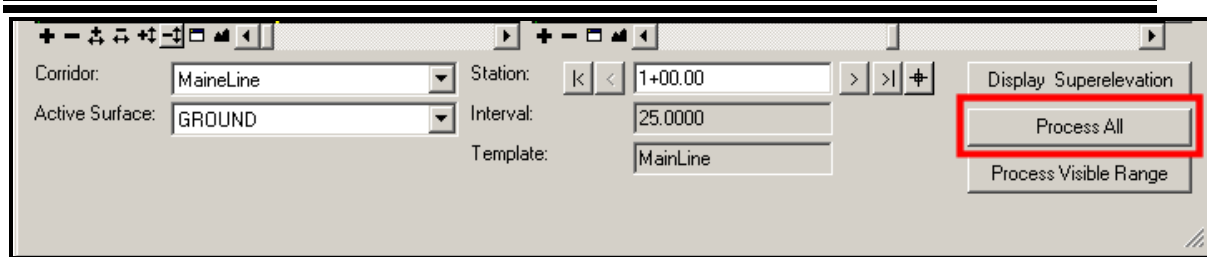


Figure 17-60: Process the corridor against the GROUND surface.

Part Three: Review the Results

Zoom and pan in the plan view area of the *Roadway Designer* to see the touchdown around the driveway edges. A yellow line will display the outer edge of the DESIGN surface should follow the match line of the driveway edges (Figure 17-61).

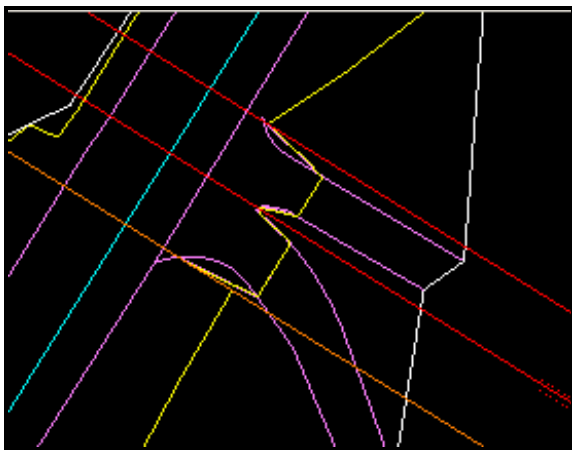


Figure 17-61: Design surface following the DRIVE EDGES.

- ♪ If the yellow line of the Design surface doesn't hit the match line of the driveways, consider changing the *Interval* of the template drop through the driveway to a 2' or even a 1' interval.
- ♪ If the driveway is on a heavy skew it may be necessary to use the Driveway Option 2 and develop a centerline down the driveway.

CREATE NEW SURFACE AND REVIEW

Overview

Now you should create the **DESIGN** surface and view the results in the plan as well as cross sections. Some final tweaking may need to be done to the template drops as well as additional cross sections added.

Step One: Set Global Scale Factor

Adjust the *Global Scale Factor* by selecting **Tools>Global Scale Factors** and setting the factors to 300, 300, 300 for 1' = 25' drawings (600, 600, 600 for 1" = 50' drawings) (Figure 17-62).

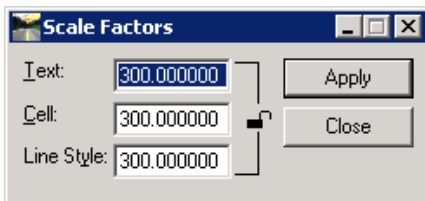


Figure 17-62: Global Scale Factors set for 1'=25' plan display.

Step Two: Create DESIGN Surface

Select **Corridor>Create Surfaces...** from the *Roadway Designer* menu. Enter **DESIGN** as your final surface as a standard. Setup the dialog as seen in Figure 17-63. Click **Apply** and then close the dialog.

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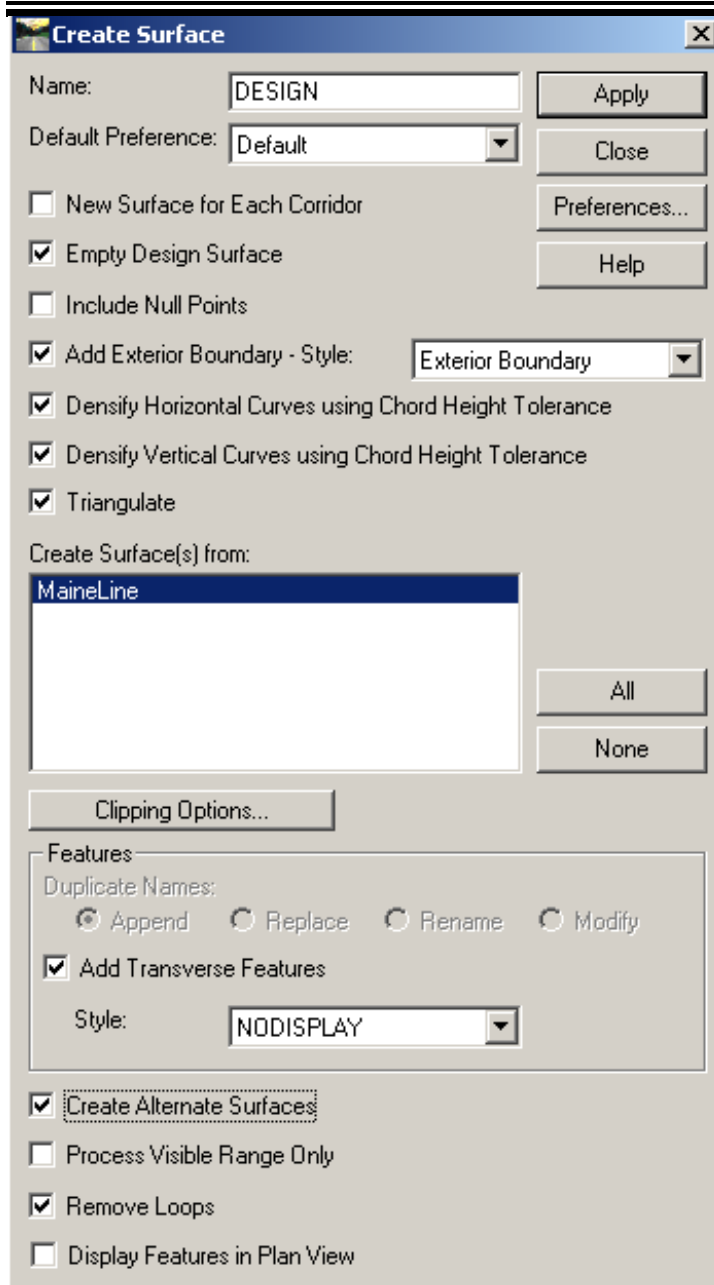


Figure 17-63: Create Surface dialog ready to create the DESIGN surface.

The *Create Alternate Surfaces* can be unchecked to speed up the process, however it should be turned on for the final surface creation.

Step Three: Add Symbology to DESIGN

Browse to the *Surface* tab, right click on the **DESIGN** surface and select *Properties*. On the *Advanced* tab, set the **Cross Section** and the **Profile Symbology** to **D_Roadway_Centerline** (Figure 17-64). Click **Apply**.

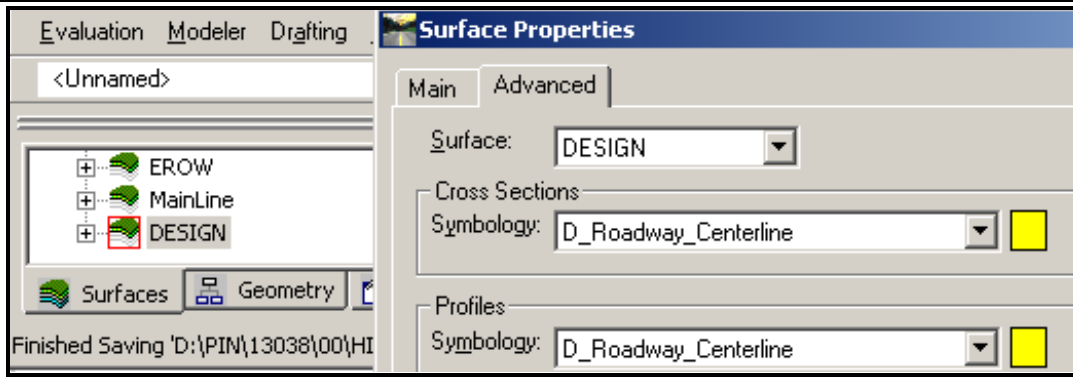


Figure 17-64: Set the symbology for the DESIGN surface.

Step Four: View Surface Features

Turn on the **PLAN DISPLAY** filter. Select **Surface>View Surface>Features...** from the InRoads menu. With the *Surface* set to **DESIGN**, (Figure 17-65) hit **Apply**. Repeat the process for the **DRIVE EDGES** and then **Close** the dialog. Fit the view.

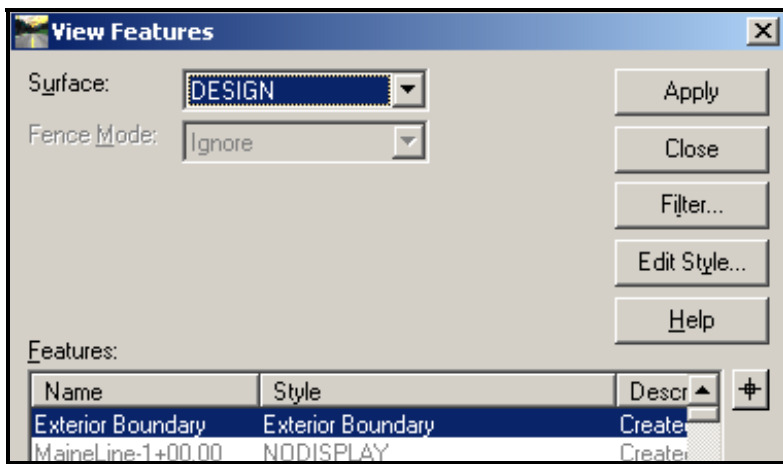


Figure 17-65: View Features of the DESIGN surface.

Step Five: Review Curb Openings

There is a known bug with the stop location of a template drop. The curb in the MainLine template may not extend all the way to the edge of the driveway template drop (Figure 17-66).

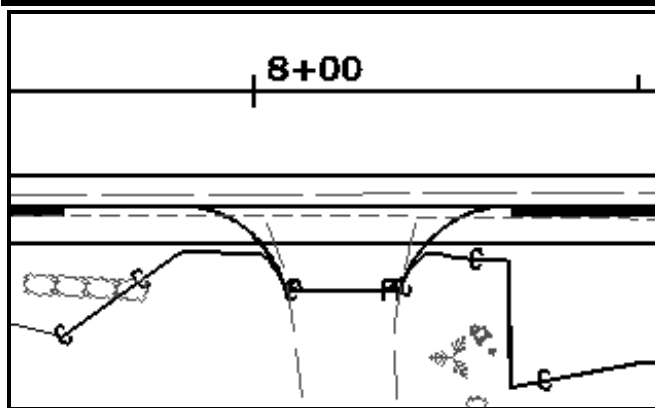


Figure 17-66: Example of curb not extending to drive edge.

To remedy this, **copy** the previous drop to the exact same station of the start of the driveway template drop (Figure 17-67). Re-create the surface.

- ♪ If the new drop appears after the driveway template drop in station order, change the drop of the station to .01' prior to the driveway drop.

Current Template Drops:

Station	Inter...	Template	Revi...	Library
5+52.39	1.0000	MainLine	IRD	D:\PIN\13038\00\
6+25.07	25.000...	MainLine	ITL	D:\PIN\13038\00\
7+90.08	25.000...	MainLine	ITL	D:\PIN\13038\00\
7+90.08	1.0000	MainLine	IRD	D:\PIN\13038\00\
8+33.49	25.000...	MainLine	ITL	D:\PIN\13038\00\
10+37.20	1.0000	MainLine	IRD	D:\PIN\13038\00\
11+11.32	25.000...	MainLine	ITL	D:\PIN\13038\00\

Figure 17-67: Template drop copied to the exact station of the driveway drop.

The results adjust the curb to the intersection of the radius and the edge of proposed shoulder (Figure 17-68).

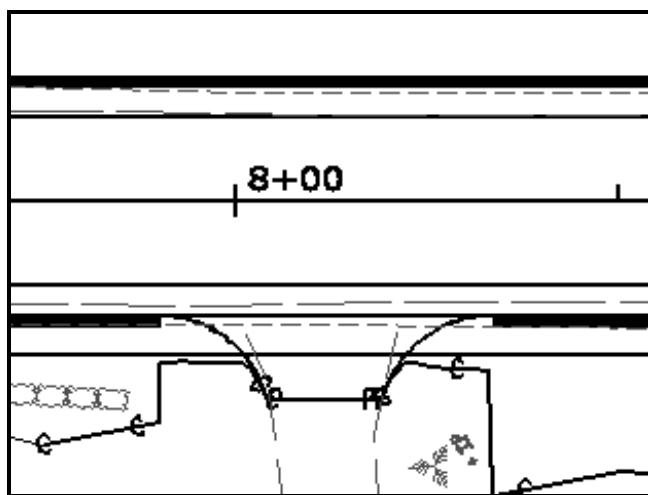


Figure 17-68: Results of the additional template drop.

Step Six: Review the Cross Sections

Part One: Set Global Scale Factors

Select **Tools>Global Scale Factors** from the InRoads menu and set the scale as you previously did (i.e. 60, 1, 60 for 1" = 5' sections or 120, 1, 120 for 1" = 10' sections) (Figure 17-69).

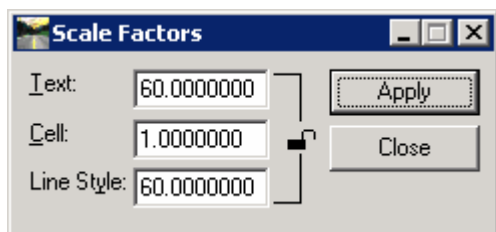


Figure 17-69: Global Scale Factors set for Cross Section display.

Part Two: Turn on Station Lock

Turn on the **Station Lock** from the *Locks* toolbar on the InRoads main dialog (Figure 17-70). This is especially important if your project starts at an odd station (i.e. 0+59.42).

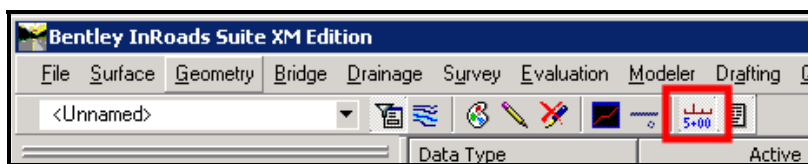


Figure 17-70: Station lock pushed and active.

Select **Evaluation>Cross Sections>Create Cross Sections** and pick the **GROUND** and the **DESIGN** surfaces from the *General* leaf (Figure 17-71).

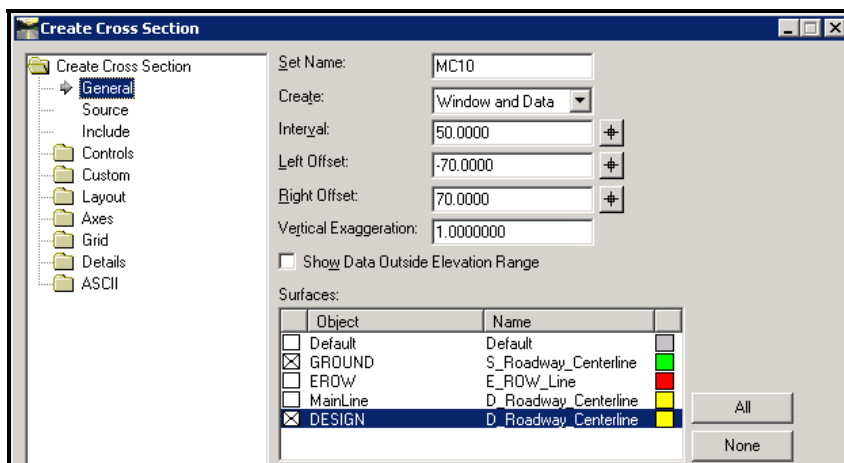


Figure 17-71: Select the Ground and Design surfaces.

Browse to the **Controls>Critical Stations** tab and uncheck all options.

Browse to the **Custom>General** leaf and *Import* your previous custom sections by selecting the **Import** button.

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Add a **Station Range** cross section set with a 25' interval. Adjust the width of the sections as necessary (Figure 17-72). Add **Crossing Features** and **Projected Features** with a 25' *Ahead* and *Back* band.

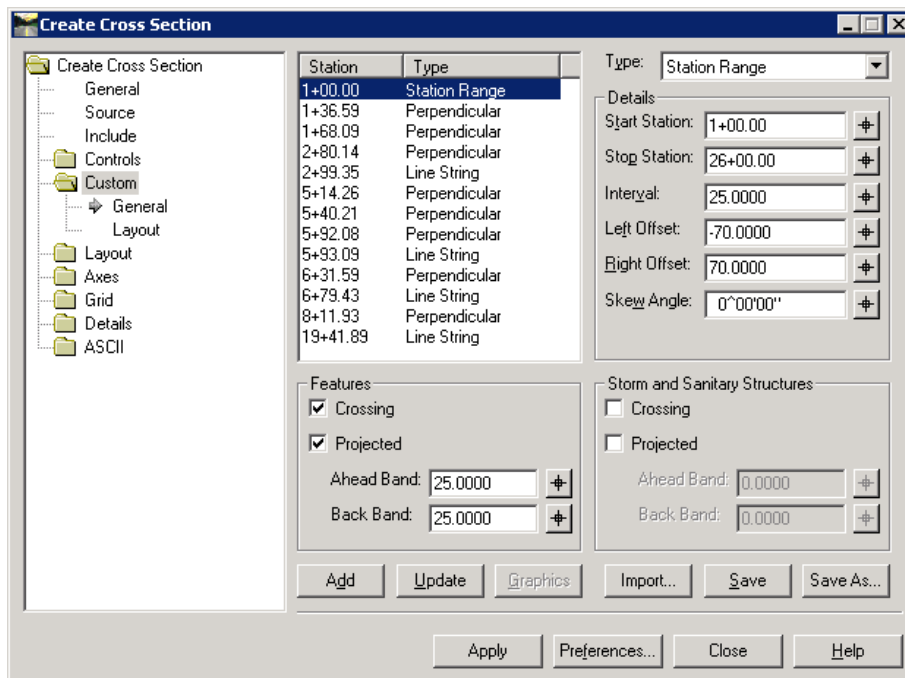


Figure 17-72: Create Cross Sections dialog.

Rotate to a top rotation if necessary. Click **Apply** and place the cross sections in your view. Sections cut at the driveway locations should have the exact slopes as you placed originally. Sections that catch the driveway may have a slightly different slope percentage as it meets the field conditions.

Step Seven: Annotate Section

✓ *Annotate cross sections as described on page 20-13.*

DRIVEWAY DESIGN OPTION 2 (ALIGNMENT METHOD)

CREATE HORIZONTAL ALIGNMENTS

Prerequisites

Project Loaded

Final Alignment Design

Corridor Develop w/“Typical” Templates

Superelevation Applied

MainLine Surface Created

✓ *Refer to page 16-28 for instructions on writing the design to a surface.*

Step One: Create a Working Drawing

Select **File>Make Sheetz** from the MicroStation main menu. Create a *No Prefix* drawing called either **Highway_drives** or **Bridge_drives** based on your workgroup.

✓ *Refer to page 1-18 for more information on using the Make Sheetz program.*

Select which reference files you want to display (i.e. alignments.dgn, topo.dgn, text.dgn, rwplan.dgn) as well as the levels in each reference file. You may want to shut off the **Highway** or **Bridge** drawing if one has been created. The *features* for the MainLine will be written to this drawing through InRoads.

Step Two: Display MainLine Surface Features

Set the *Filter* to **Plan Display** and turn on the filter. Select **Surface>View Surface>Features...** from the InRoads menu. Select the **MainLine** surface and click **Apply**.

Step Three: Make your Geometry Project Active

On the *Geometry* partition in the InRoads explorer, make sure that the **MC10** alignment is active (Red box around it) Figure 17-73. If it isn't active, make it active by right clicking on the name and selecting **Set Active**.

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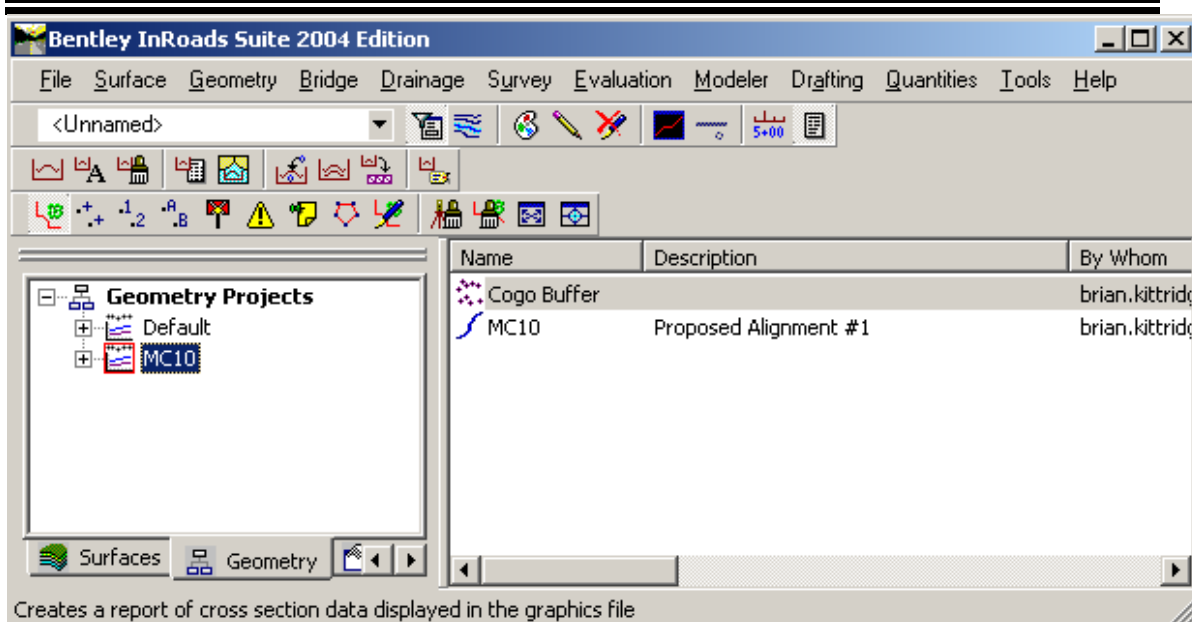


Figure 17-73: Set Geometry Active

Step Four: Draw Drive in Plan Location

Place Standard Cell in Plan View (Option One)

Select **Driveways (Plan)** from the left side of the *Settings Manager*, then select the driveway scenario that best represents the situation (i.e. **UnCurbed Residential Entrance RT** or **Uncurbed Commercial Entrance RT**) and place the cell at the edge of the proposed shoulder in between the two edges of the existing entrance (Figure 17-74). Use the “O - (origin)” and “RQ – (rotate quick)” *AccuDraw* commands to rotate place the drive at center of existing and perpendicular to the centerline. This method is best for drives along a tangent portion of the centerline.

✓ *For more detailed instructions on cell placement methods, refer to page 17-6.*

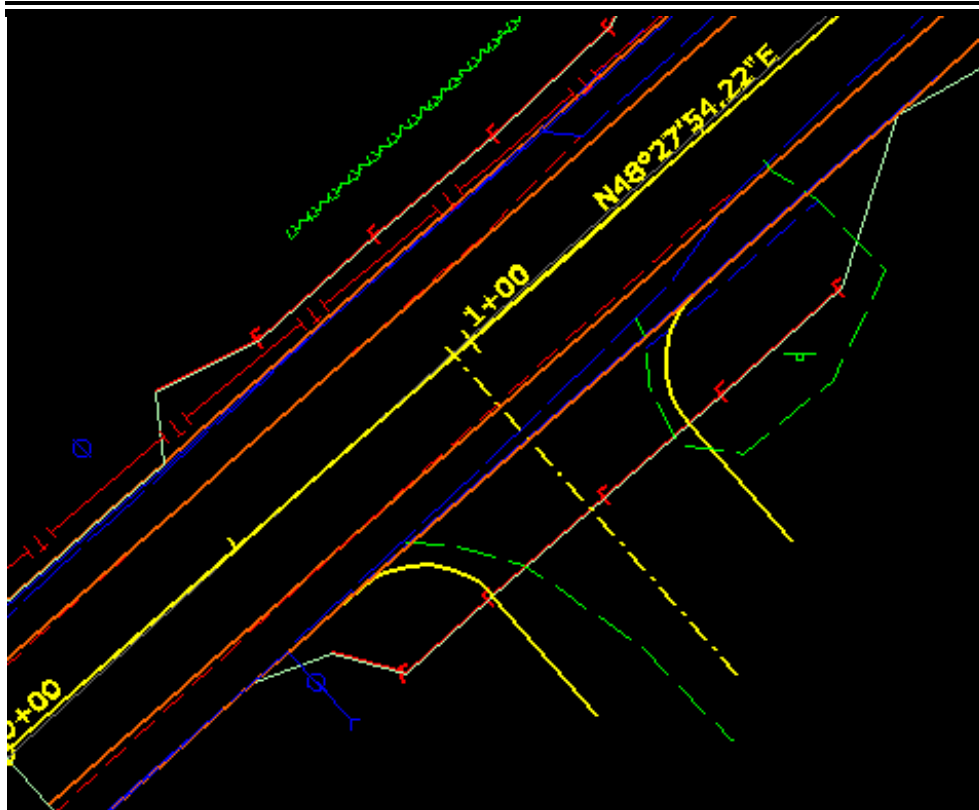


Figure 17-74: Place driveway lines in plan view

Draw drive manually in Plan view (Option Two)

Locate a driveway you want to work with. Select **Driveways (Plans)** from the left side of the *Settings Manager*, then select the “Driveway Edge” scenario that best represent your driveway type (i.e. **Driveway Edge Paved RT** or **Driveway Edge Gravel RT**) to set the *Level, color, Style and Weight*. Now draw the line work for your drive according to the *Standard Details*.

Select **Driveways (Plans)>Driveway Centerline** from *Settings Manager*. Set the *Snap* mode to **Perp** and draw the driveway centerline perpendicular to the MainLine alignment down the center of the driveway.

- ♪ For skewed drives, draw the driveway centerline perpendicular from the main line centerline to the back edge of the sidewalk or 6’ into the driveway (3’ minimum) to keep first bump or sidewalk parallel with the shoulder edge. Then add an angle point and continue through the drive at the approximate centerline staying within the extents of the existing driveway.

Step Five: Import Drive 1 Edge Left

If you used a predefined cell placed from the *Settings Manager*, drop *Complex* on the cell by selecting **Qualities>Drop>Complex** from *MicroStation’s* main menu and click on the cell.

In InRoads, select **File>Import Geometry**. Set the *Type* to **Horizontal Alignment** and enter **Drive01L** in the *Name* field. Set the *Style* to **D_Roadway_Drive_Other** (Figure

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17-75). Select **Apply** and identify the first edge of the driveway and **Accept** with a left click anywhere in the view window. Right Click to return to the *Import Geometry* dialog. Repeat for second driveway edge and supply **Drive01R** as the *Name*.

♪ The next driveway's edges should be named Drive02L and Drive02R.

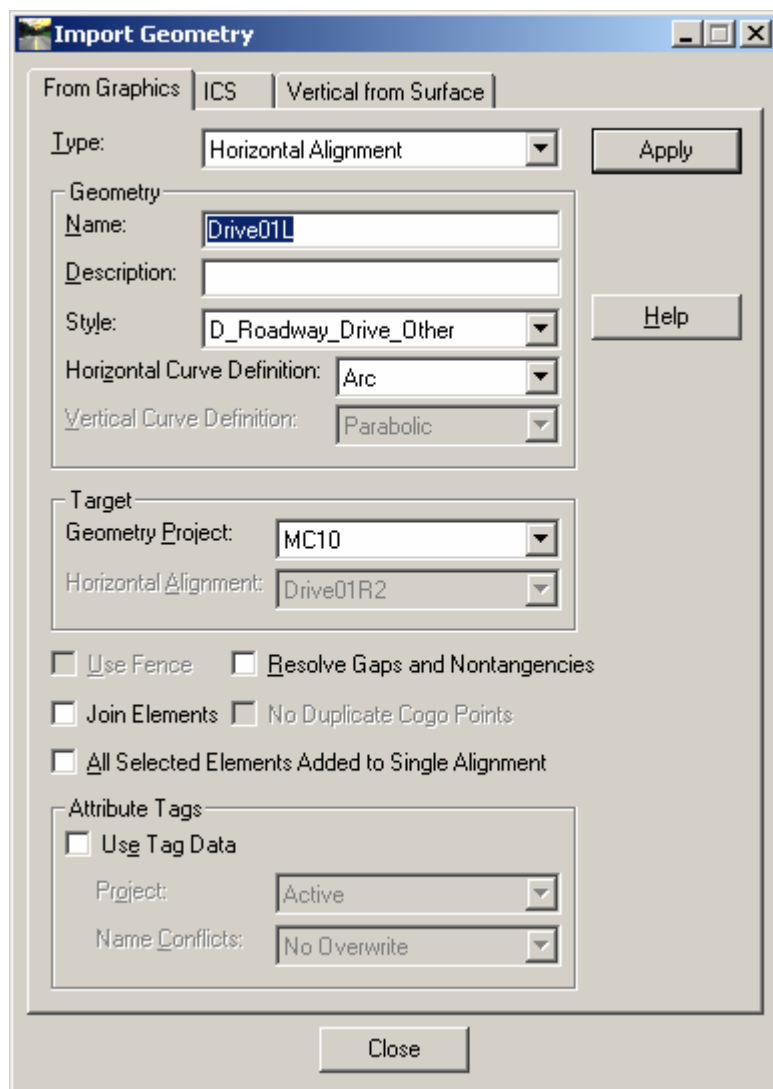


Figure 17-75: Create Drive Edge Horizontal Alignment

♪ This step can be preformed in bulk with a smart selection set.

Step Six: Import Driveway Centerline

The *Import Geometry* dialog box will remain active. Change the *Name* to “Drive01CL” in the *Name* field. Set the *Style* to **D_Roadway_Centerline** (Figure 17-76). Select **Apply** and identify the centerline of the driveway. **Accept** with a left click anywhere in the view window. Right Click to return to the *Import Geometry* dialog. **Close** the dialog box.

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🎵 This step can be preformed in bulk with a smart selection set.

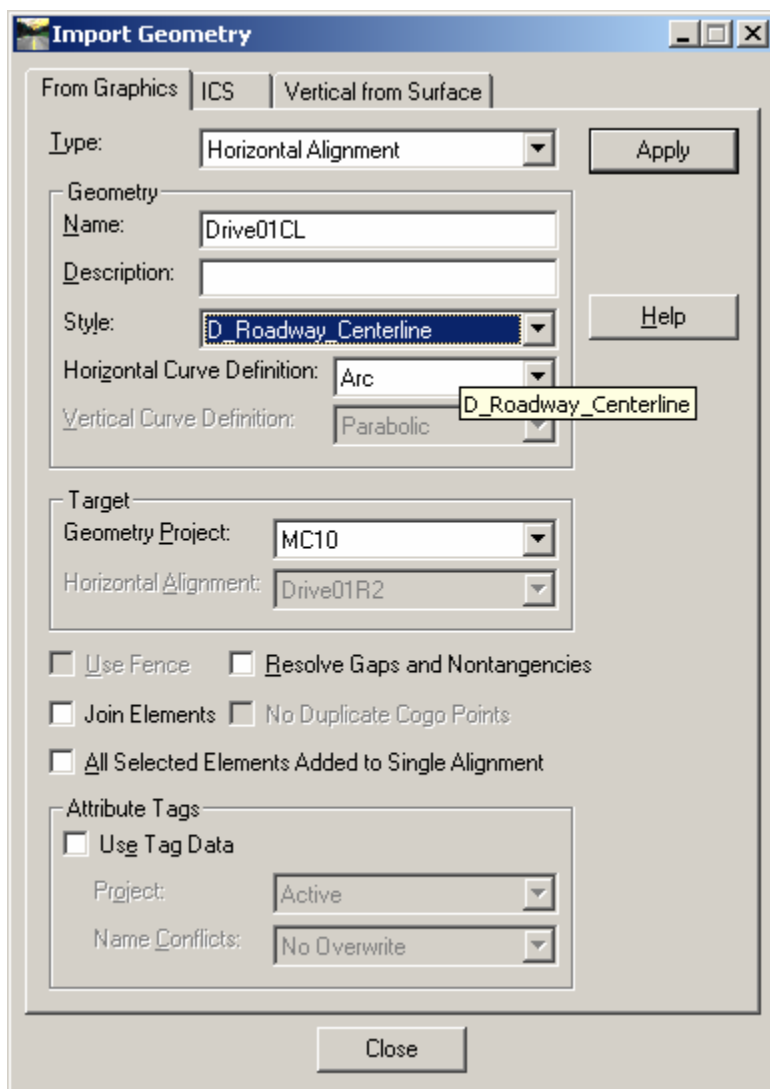


Figure 17-76: Create Driveway Centerline Alignment

Step Seven: Transpose Centerline (Optional)

🎵 If you drew the centerline of the driveway manually (not from cell placement), you will need to *Transpose* the alignment. This will invert the stationing direction since the MicroStation element was drawn from Mainline towards property owner. The expected direction should be from property owner to Mainline. Cell placement from the *Settings Manager* takes this into account.

From the InRoads menu, select **Geometry>Utilities>Transpose** (Figure 17-77). Click on the cross hairs and pick the Drive01CL alignment from the drawing. Select **Apply** and **Close** the dialog box.

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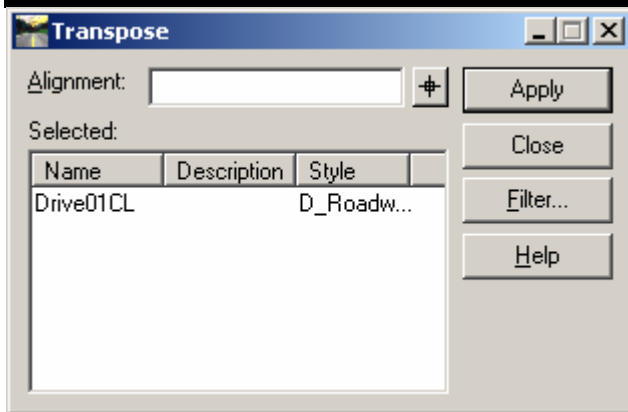


Figure 17-77: Transposing the driveway alignment

EDIT TEMPLATE DROPS IN MAIN LINE

Step One: Open Roadway Designer

Select **Modeler>Roadway Designer** from the InRoads main menu. Display the *Corridor* for your Main Line and set the *Active Surface* to Ground.

Step Two: Display References

From the Roadway Designer menu, select **Corridor > Display References**, select *Alignment* and select the **Drive01CL** alignment (Figure 17-78). Select **Add**.

♪ It's also good to display the ROW and Existing Edges in the plan portion of the *Roadway Designer*.

✓ *Refer to page 16-11 for details on adding the ROW and page 16-8 for adding existing edges.*

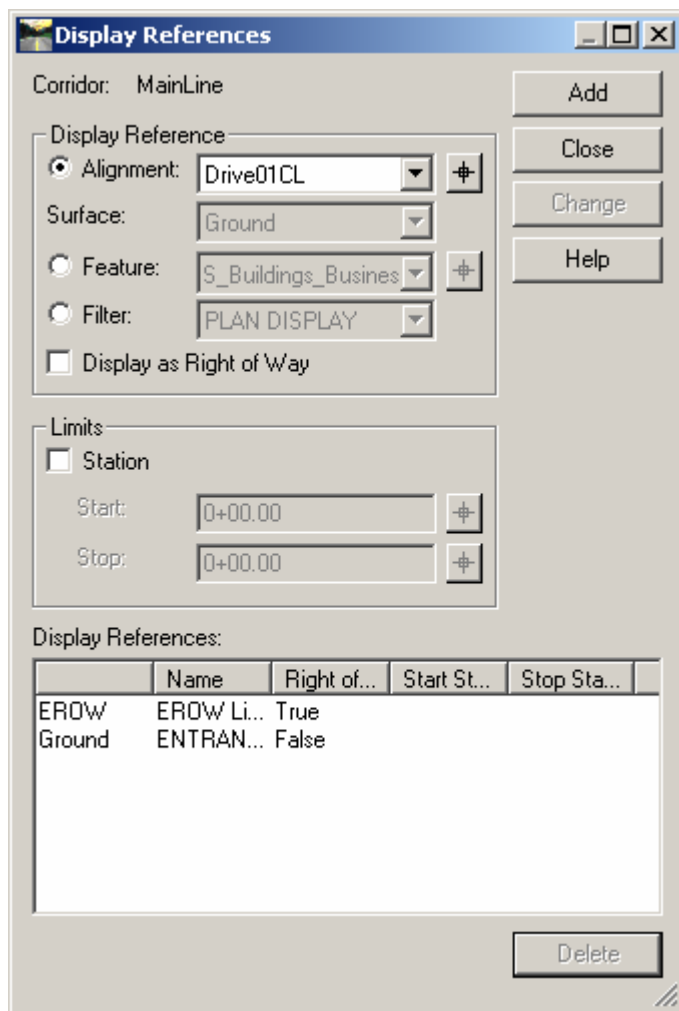


Figure 17-78: Display Driveway Centerline in Roadway Designer

Select the **Drive01L** alignment, select **Add**. Select the **Drive01R** alignment, select **Add** and close the dialog box. The plan view in the *Roadway Designer* view should now look like the caption below (Figure 17-79).

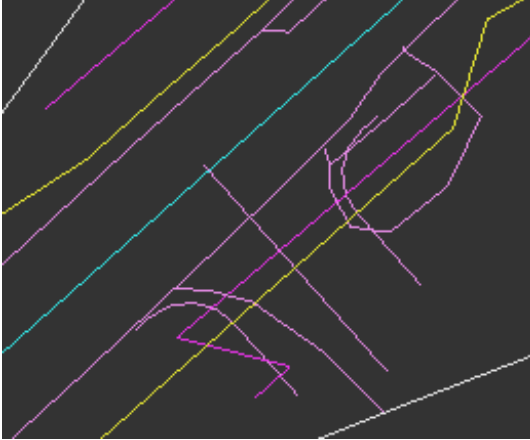


Figure 17-79: Roadway Designer with references displayed

Step Three: Add Template through Drive

From the Roadway Designer menu, select **Corridor>Template Drops** and select the *Template* you dropped for the MainLine through the drive opening (i.e. Box Section). While holding down the **Ctrl** key, click the “target” button. This will allow you to identify a point in the plan view of MicroStation. Snap to the end of the driveway where it meets the edge of shoulder. Set the *Interval* to 1.00 and select **Add** (Figure 17-80).

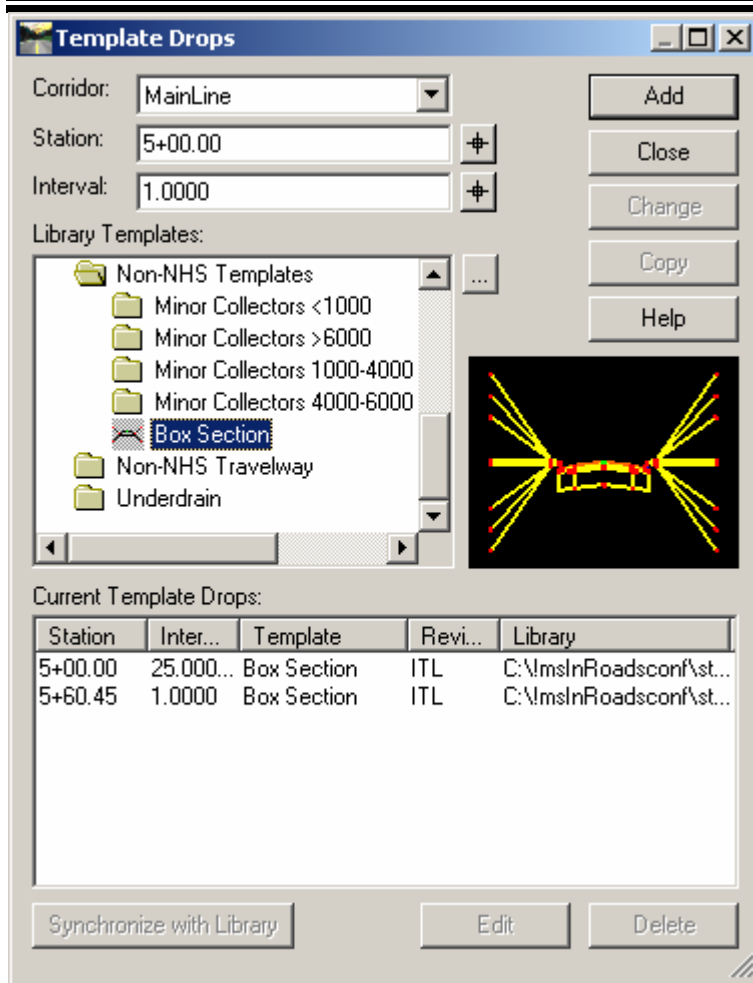


Figure 17-80: Add template used through the driveway

Step Four: Copy Mainline Template

Select the template drop from the *Current Template Drops* list that was used up to the first edge of the driveway. While holding down the **Ctrl** key, click the “target” button. This will allow you to identify a point in the plan view of MicroStation. Snap to the end of the driveway (up-station) where it meets the edge of shoulder. Select **Copy** (Figure 17-81).

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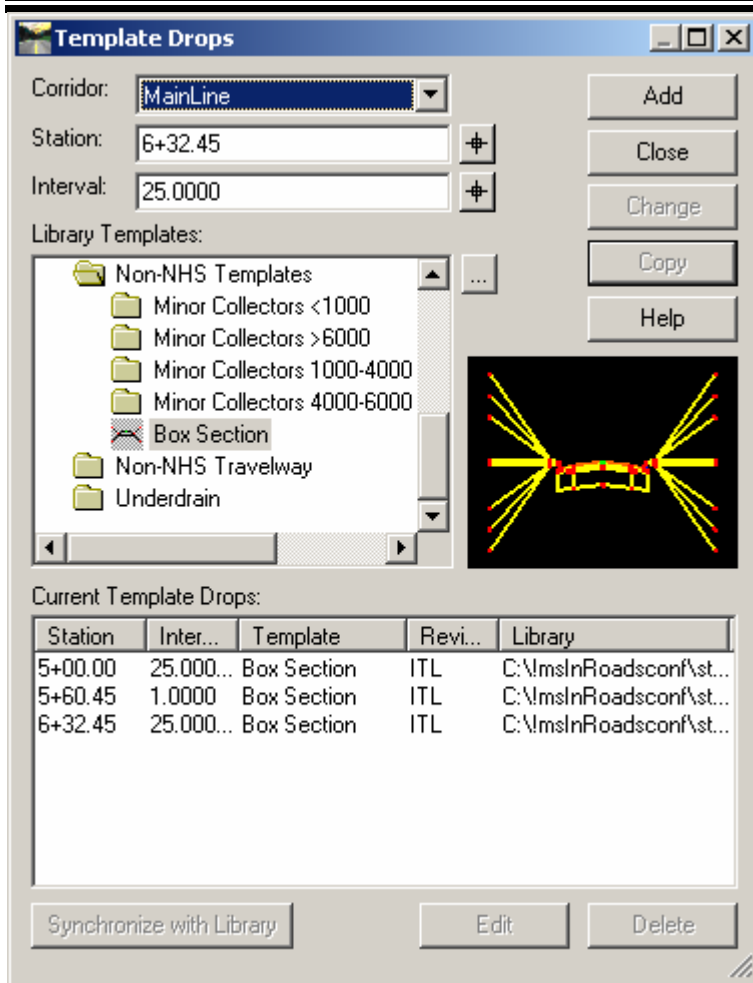


Figure 17-81: Copy template used prior to drive location and Copy to new station

Step Three: Modify Template in Drive Area

Part One: Delete Unnecessary Components

Double Click the template that runs through the drive area (i.e. 5+60.45). This brings up the *Create Template* dialog. Delete the components not needed through the drive. This should be the curb, berm and slope lines and anything outside of the edge of shoulder. Delete by Right Clicking and selecting *Delete Components*. Drawing a line around the components. Delete all remnants of points or components. Below are the before (Figure 17-82) and after (Figure 17-83) screen captures. Select **OK**.

Notice that the template through the driveway is now red. This means that it has been *Revised In* the IRD. **Close** the *Template Drop* dialog.

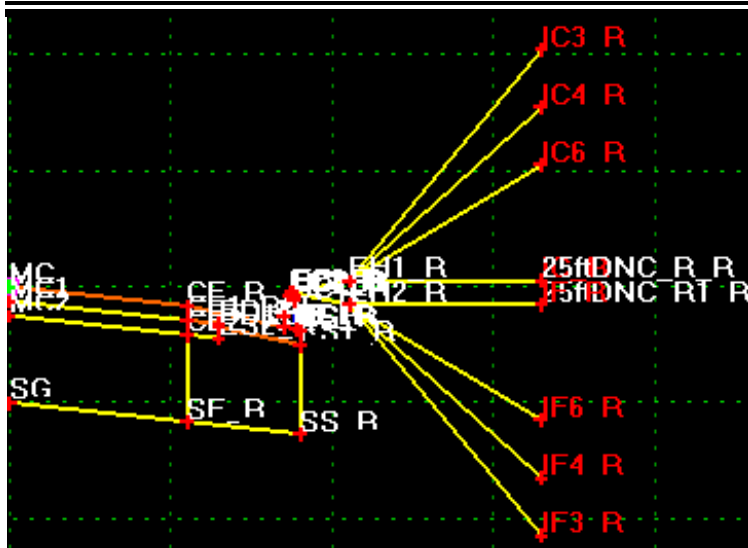


Figure 17-82: Before deleting components

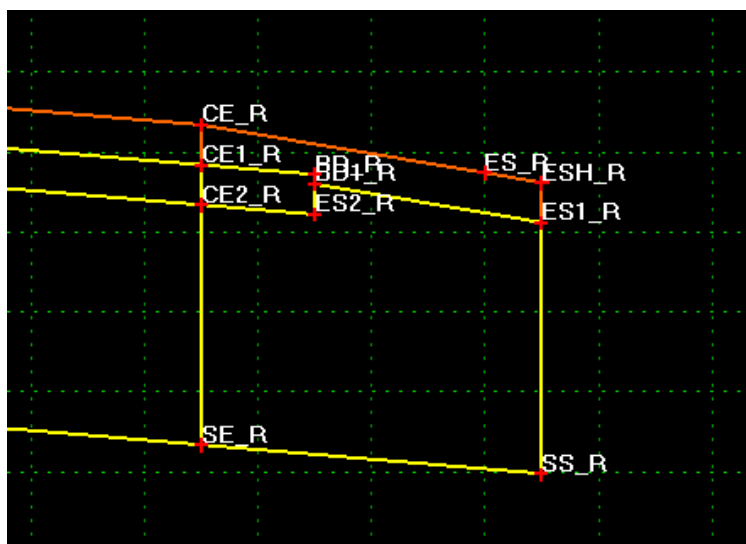


Figure 17-83: After deleting components

Part Two: Adjustments to Points

Different templates will require different adjustments. This step will require that you make the gutter line (ES point) the furthest point away from the centerline in the template (17-60). Brief descriptions of the edits depending on the scenario are listed below.

Bituminous Curb

In this case, edit the ESH point and adjust the *Horizontal* offset to zero. Click **Apply**. Right click the CG point, select *Merge* and pick the ES point.

Granite/Concrete Curb

Delete the extended subgrade component underneath the curb. Right click the CG1 or CG2 point, select *Merge*, pick the ES point and then click **Apply**.

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Sidewalks

Delete the sidewalk components and point SW1 on bituminous curb or the FC1 point on concrete or granite curb. Depending on the curb type, do one of the previous edits.

Daylight Section

Edit the SS point and change the *Vector Offset* that holds the point to the ES and IF to a *Horizontal* constraint of zero to the ES point.

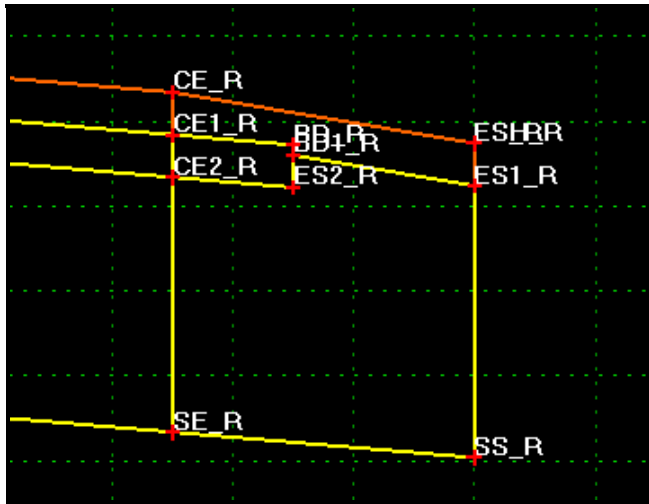


Figure 17-84: ESH point moved to ES point on bituminous curb sections.

CREATE MAINLINE SURFACES

Step One: Process All

In InRoads designer, select the *Process All* button at the bottom right of the window.

Step Two: Create Design Surface

In the Roadway Designer window, select **Corridor>Create Surface**. Type in “Design” for the *Name*, enable *Empty Design Surface*, *Add Exterior Boundary*, *Triangulate*, and *Create Alternate Surfaces*. *Add Transverse Features* should also be selected and its *Style* set to **NODISPLAY** (Figure 17-85). Select **Apply**.

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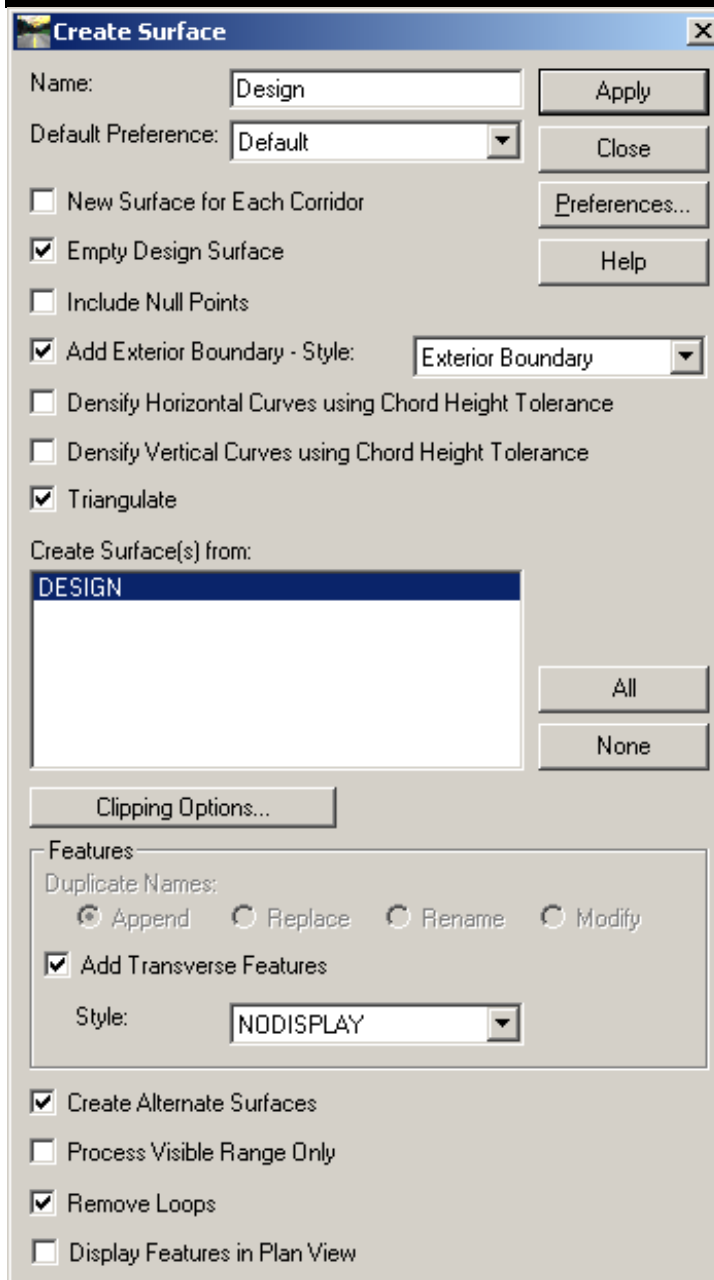


Figure 17-85: Create Design Surface

Minimize InRoads Roadway Designer (clicking on the minus sign at the top right part of the window).

CREATE VERTICAL ALIGNMENTS

Overview

The driveway alignment can be done a number of ways. To help in the process, there are driveways cells based on the *Standard Details* that can be placed and used as a guide during the process. The alignments can also be done without the guides by using a series of InRoads commands. The document will cover using a mixture of both.

Step One: Display Driveway Profile

From the InRoads menu, select **Evaluation > Profile > Create Profile**. On the *General* tab, select the **Ground**, **Design** and **Subgrade** surfaces and set their *Styles* by selecting the *Properties* button. Make sure that the *Vertical Exaggeration* is set to **1.00** (Figure 17-86). From the *Source* tab, select the **Drive01CL** alignment.

- ♪ Depending on which direction your driveway centerline runs (centerline out to property owner or property owner towards centerline) and whether it's on the left of centerline or on the right, you may want to adjust the *Direction* from **Left to Right** or **Right to Left**.

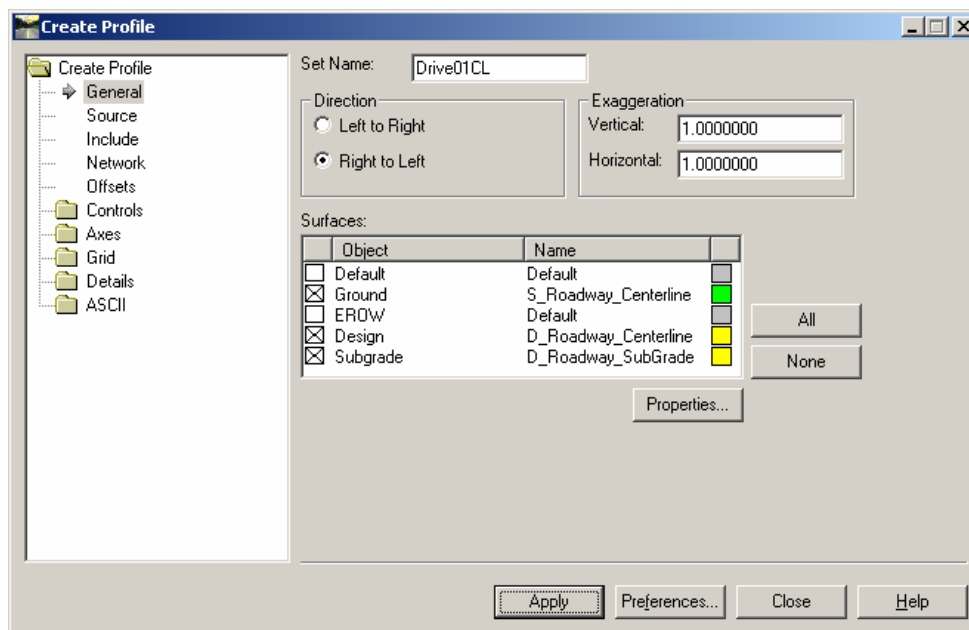


Figure 17-86: Create Profile dialog

Select **Apply** and place the profile (Figure 17-87) window in the drawing.

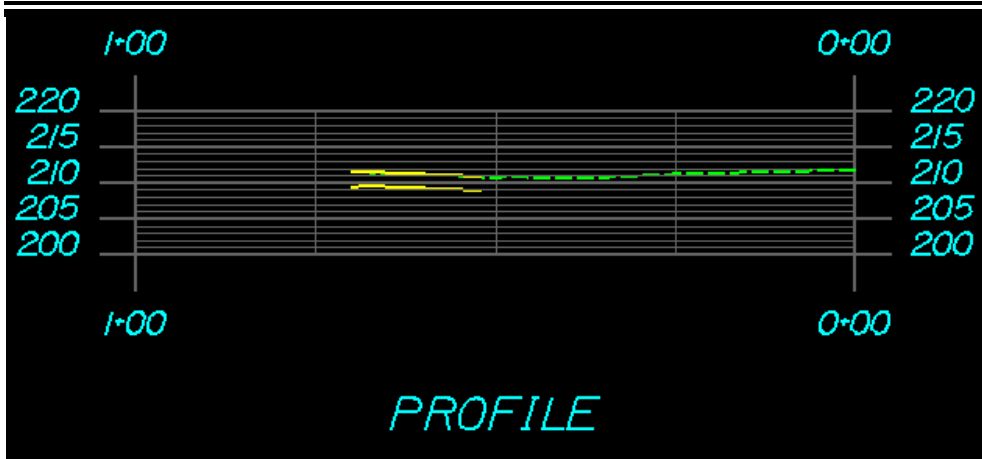


Figure 17-87: Driveway Centerline Profile

Step Two: Place the Driveway Cell (Optional)

Part One:

From the MicroStation's *Settings Manager*, select the appropriate driveway scenario that best fit the conditions. In this case, choose **Driveways (Cross Sections)>Driveway Level Left** from the *Settings Manager*. Place the cell at the top edge of the Mainline Surface (Figure 17-88). This point is the gutter line.

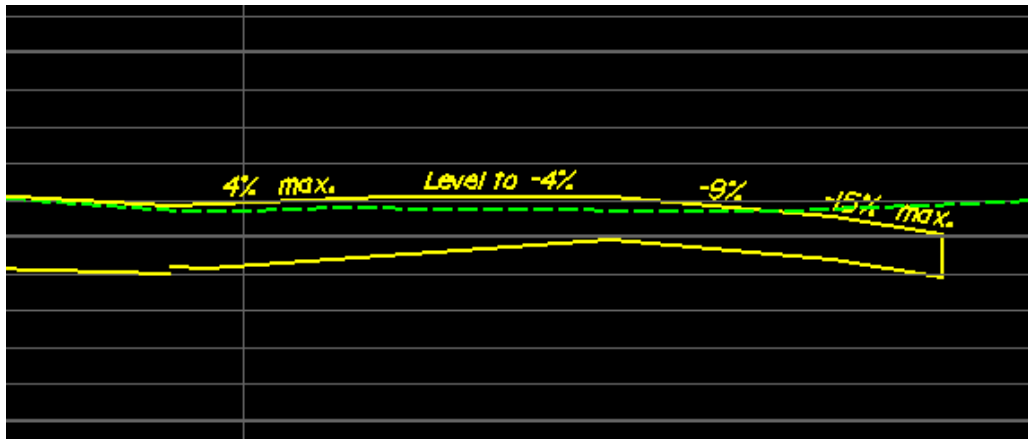


Figure 17-88: Driveway placed at gutter line

Part Two: Adjust the Subgrade

Because the depth of subgrade and pavement layers at the edge of the shoulder can vary, the subgrade of the drive needs to be adjusted to match Main Line subgrade. Select the Main Line subgrade line and the *Ground* with MicroStation's *Element Selection* tool (Figure 17-89) or by selecting **Group>Element Selection>Select Element**. Use the *Ctrl* key to select multiple elements.

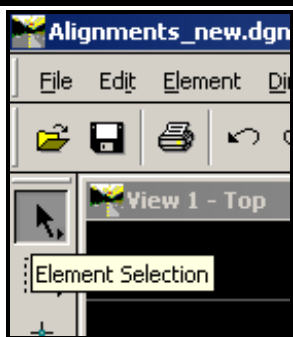


Figure 17-89: Location of the Element Selection Tool

Select **Edit>Lock** from the MicroStation main menu. This will lock the element and prevent it from moving. Place a *Fence* using the *Place Fence* tool (or selecting **Group>Fence>Place Block**) encompassing the bottom portion of the driveway subgrade (Figure 17-90).

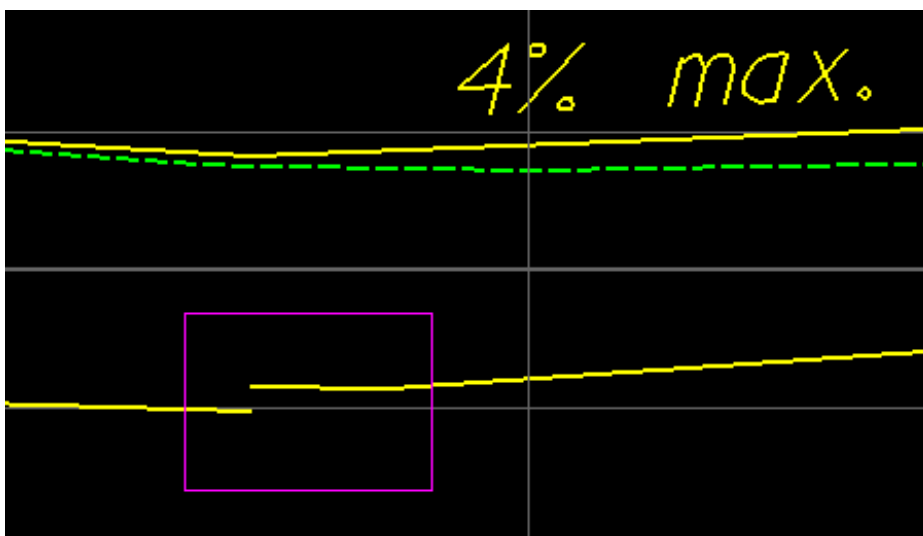


Figure 17-90: Placing a fence around the subgrade

Select the *Manipulate Fence Contents* tool, set the *Method* to *Stretch* and the *Mode* to *Inside* (or select **Group>Stretch Fence**) and snap to the end of the driveway subgrade and **Accept** this point. Now snap to the bottom of the Main Line subgrade point and **Accept** to connect the subgrade points.

Part Three: Adjust Driveway Match Point (Optional)

Depending on the driveways severity, it may be useful to adjust the cell (used as a guide) to visually match the existing ground. Using the same *Place Fence* and the *Stretch Fence* commands, place a fence encompassing the end of the driveway (Figure 17-91).

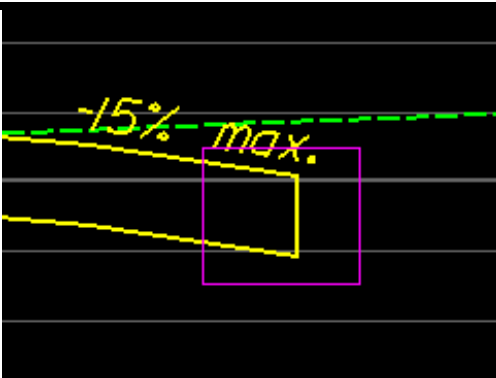


Figure 17-91: Stretching driveway to match point

Adjust the match point by snapping and **Accepting** to the top point of the driveway and *Stretching* it to the original ground. Connect it to the *Ground* by typing “N” on the keyboard to set the *Nearest Snap* mode. Snap and **Accept** to the *Ground*.

- ♪ Drop the cell and delete the vertices of the outermost driveway bump if not needed.
- ♪ Check the current grade by selecting **Proposed Text and Dims>Slope%** from the *Settings Manager*. Snap and **Accept** to two points on the proposed line segment that meets the *Ground*. The slope of the line segment will display in the *Text Editor* dialog.

Step Three: Create a Vertical Alignment

Verify that the **Drive01CL** alignment is active by right clicking in the InRoads Explorer window and selecting **Set Active**. In the same Explorer window, highlight on the **DriveCL1** alignment and select **New** (Figure 17-92). Set the *Type* to **Vertical Alignment** and type in **Drive01CL**, set the *Style* to D_Roadway_Centerline select **Apply** and close the dialog box.

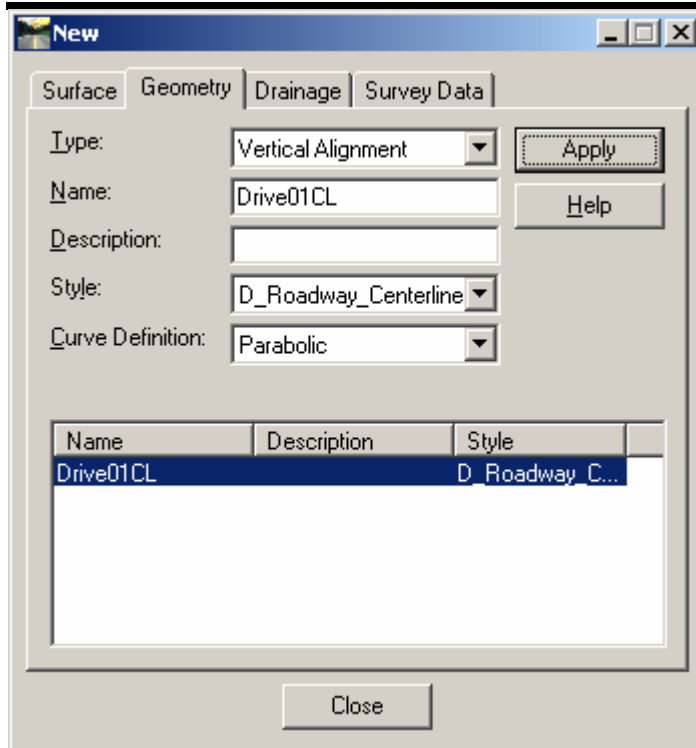


Figure 17-92: Create Vertical Alignment Name

Step Four: Define Vertical Alignment (By Two Points Option)

This option uses the cell placed at the edge of the Main Line shoulder.

From the InRoads menu, select **Geometry>Vertical Element>Add Fixed Line** and set the *Mode* to **By Two Points** (Figure 17-93) and select **Apply**.

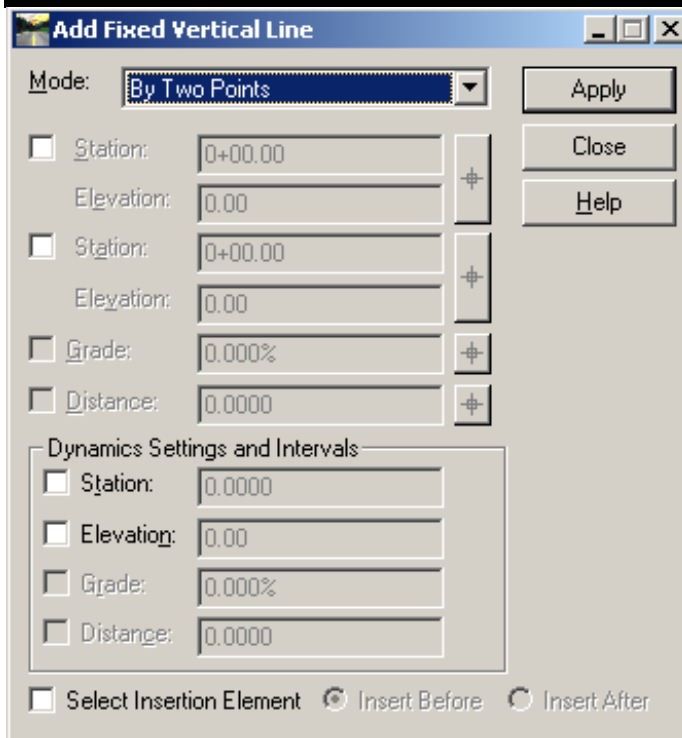


Figure 17-93: Add Fixed Line By Two Points dialog

Snap to the top rightmost point of the cell placed at the Edge of shoulder from the Mainline Surface. For the second point, snap to the end of the segment to the left of the previously selected point, **Accept** the snap and **Accept** the command. Since the Vertical element stays current, snap to the end of the second segment on the cell and **Accept** the snap and **Accept** the command. Continue this process along the cell until you are at the point where you want to match the existing ground surface. Connect it to the *Ground* by typing “N” on the keyboard to set the *Nearest Snap* mode. Snap and **Accept** to the *Ground*. **Accept** one more time to finalize the point. Right click two times to return to the *Add Fixed Vertical Line* dialog.

Step Five: Define Vertical Alignment (By Point, Distance and Grade Option)

This option is for generating a vertical alignment for the driveway by manually generating the bumps at a desired distance and grade.

From the InRoads menu, select **Geometry>Vertical Element>Add Fixed Line** and set the *Mode* to **By Point, Grade and Distance**. Set the grade and distance of the first bump desired (i.e. -2% for -6') Figure 17-94. Snap to the edge of the Main Line shoulder and **Accept** the snap mode and **Accept** the placement. Right click to get back to the *Add Fixed Vertical Line* dialog.

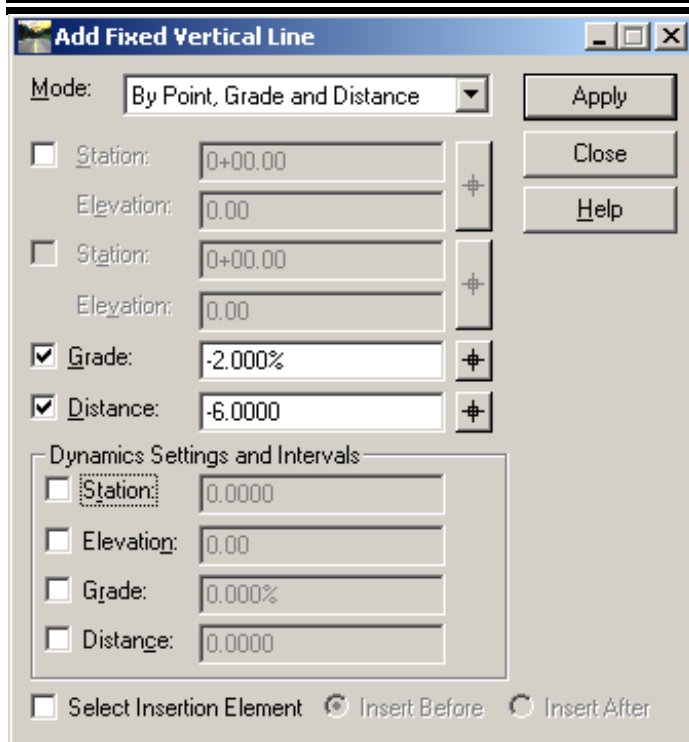


Figure 17-94: Add Fixed Line By Point, Grade and Distance dialog

Next, add the distance and grade for the next bump. Click **Apply** and snap and **Accept** to the end of the first line segment and click **Accept**. Right click to get back to the *Add Fixed Vertical Line* dialog.

Repeat until all the bumps are defined. If you know what the desired final match slope is, set the grade to that slope and do not place a value in the distance field. This will allow you to adjust the distance graphically and use a *Nearest* snap to connect to the existing ground. **Accept** the snap and **Accept** the command. Right click to get back to the *Add Fixed Vertical Line* dialog.

Step Six: Editing the Vertical Alignment (Optional)

This sequence is for adjusting an existing driveway alignment after it has been defined.

Set the vertical alignment active by right clicking on the alignment and selecting **Set Active**. From the InRoads menu, select **Geometry>Vertical Element>Edit Element**. The first segment of the alignment will highlight. Select the **Stop** in the *Define From* radio button. Adjust the *Elevation, Grade or Length* of the vertical alignment. If this is the segment you want to adjust, make the adjustments as necessary. Click *Next* if you want to edit another segment.

Step Seven: Check Integrity

In the InRoads Explorer window, right click on the **Drive01CL** vertical alignment and select *Check Integrity* and review the elements (Figure 17-95).

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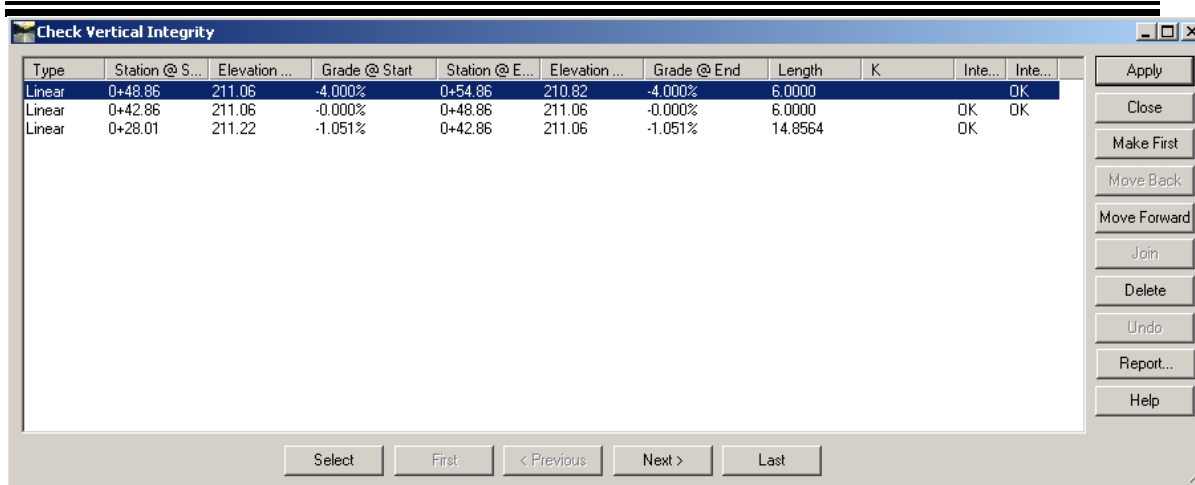


Figure 17-95: Check Vertical Integrity dialog "Wrong Order"

Verify that the first element has the least starting station value. If this is not the case, like the illustration above, highlight the last station (lowest starting station value), and select the *Make First Option* on the right side of the dialog box (Figure 17-96), select **Apply** and close the dialog box. The results will be displayed in the window.

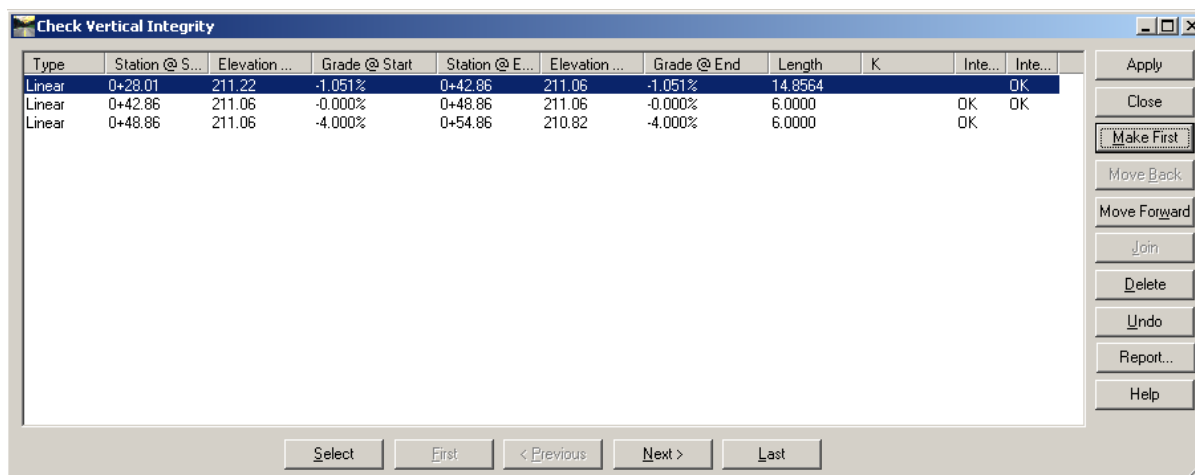


Figure 17-96: Check Vertical Integrity dialog "Correct Order"

Step Eight: Create Vertical Alignment for Subgrade

Right Click on the Drive01CL horizontal alignment and select *New*. Set the Type to *Vertical Alignment*, type in **Drive01Sub** for the *Name*, set the *Style* to D_Roadway_Subgrade (Figure 17-97) and select **Apply**.

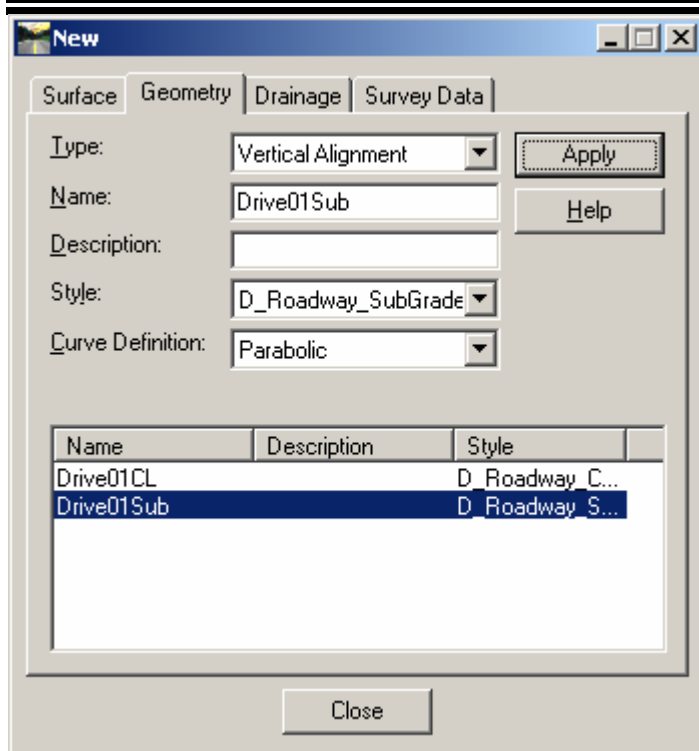


Figure 17-97: Create New Vertical Alignment for Subgrade

Using methods described previously, select **Geometry>Vertical Element>Add Fixed Line**, and either use the *by Two Points or by Point, by Distance and Grade Option*.

To end the alignment, consider using *AccuDraw* to snap to the proposed alignment for the surface of the drive, type “O” for origin, and move the mouse down in the Y direction. Enter the total depth of the subbase and pavement. Use a semicolon to enter this value in subunits. End the command and check the *Integrity*.

Step Nine: Create Vertical Alignments for Drive Edges (Optional)

This is an optional step, but can provide a better model of the driveway if the drive has a cross slope due to existing conditions.

- ♪ A cross section at the center of the driveway displaying the design is normally all that is needed to build the driveway and to get a rough estimate of quantities. Depending on project scheduling, there may or may not be enough time allotted for this kind of detail.

Repeat previous steps used to create a vertical alignment for driveway centerline and subgrade to create vertical alignments for the drive edges.

PLACE TEMPLATE DROPS – DRIVEWAY

Step One: Verify the Active Alignment

From the InRoads menu, highlight the Drive01CL vertical alignment, right click on it and make it active.

Step Two: Create Driveway Corridor

From the InRoads menu, select **Modeler>Roadway Designer**. Select **Corridor>Corridor Management** from the *Roadway Designer* menu. Type in **Drive01** for the *Name* and make sure that the *Horizontal* and *Vertical* alignment names are set to **Drive01CL** (Figure 17-98). Select **Add** and close the dialog box.

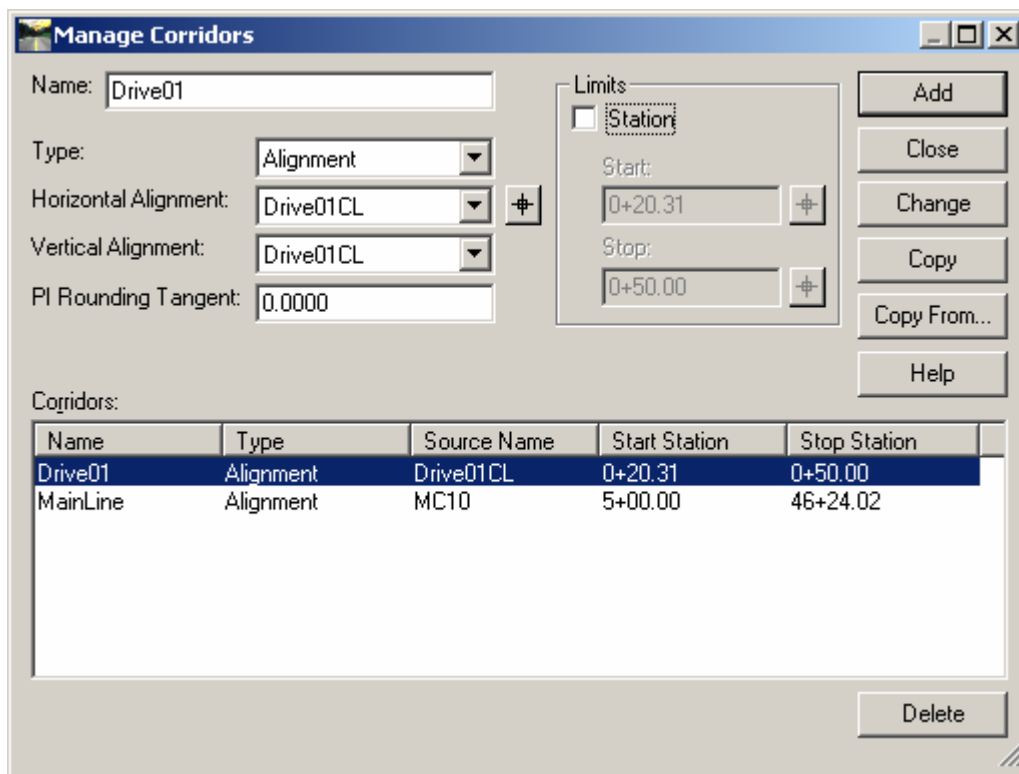


Figure 17-98: Add Drive1 Corridor

Step Three: Add Driveway Template Drop

Select **Corridor>Template Drops**, set the *Interval* to 1.00 and select the **Paved Driveway** template located under the *Driveways* folder (Figure 17-99). Select **Add** and close the dialog box.

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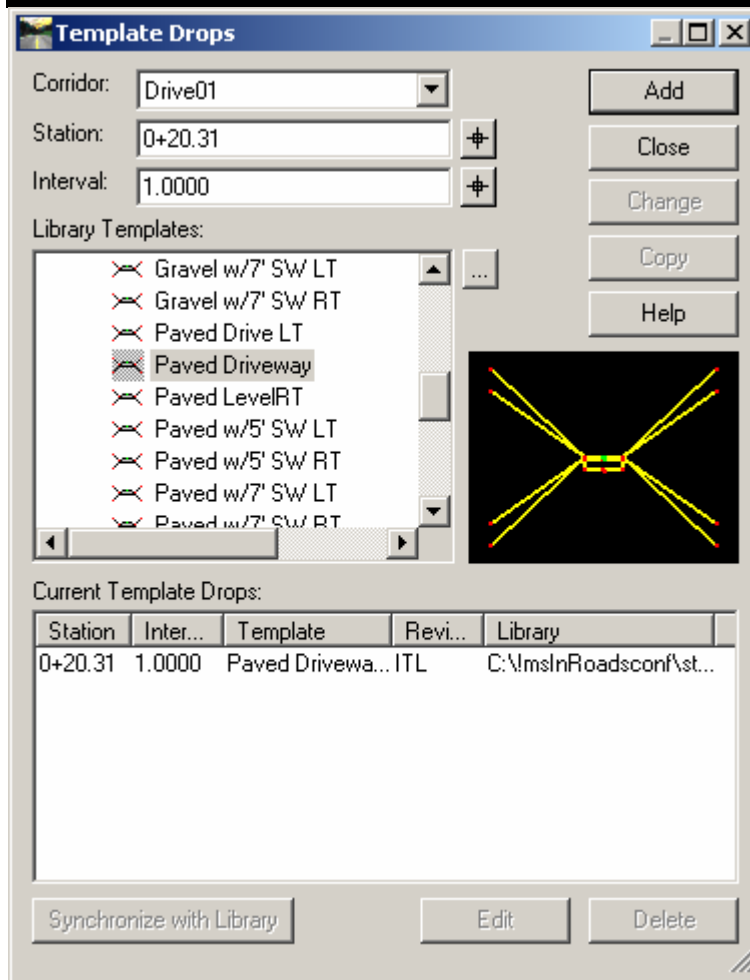


Figure 17-99: Add Template Drop for Paved Driveway

ESTABLISH POINT CONTROLS

Step One: Create Point Controls

From the InRoads *Roadway Designer* dialog, select **Corridor>Point Controls** and establish the following *Point Controls* (Figure 17-100).

Set point **ES_L** Mode to **Horizontal**, *Control Type* to **Alignment**, and set the *Horizontal Alignment* to **Drive01L**. Add the definition.

Set point **ES_R** Mode to **Horizontal**, *Control Type* to **Alignment**, and set the *Horizontal Alignment* to **Drive01R**. Add the *Point Control* definition and close the dialog box.

Point Controls

Corridor: Drive01

Point: ES_R

Mode: ☒ Horizontal ☐ Vertical ☐ Both

Control Type: Alignment

Horizontal Alignment: Drive01R

☒ Use as Secondary Alignment

Priority: 1

Station Limits: Start: 0+09.92, Stop: 0+50.00

Horizontal Offsets: Start: 0.0000, Stop: 0.0000

Vertical Offsets: Start: 0.0000, Stop: 0.0000

Buttons: Add, Close, Change, Help, Delete

En...	Pri...	Name	Start Stati...	Stop Stati...	Mode	Type	Control
X	1	ES_L	0+09.92	0+50.00	Horizontal	Alignment	Drive01L
X	1	ES_R	0+09.92	0+50.00	Horizontal	Alignment	Drive01R

Figure 17-100: Establish Point Controls to edge of Horizontal Alignments

- ♪ The driveway template edges will follow the set horizontal edge limits defined by the alignments.
- ♪ For critical drives or side roads, consider creating a profile of the driveway edges, developing vertical alignments and set the point controls to follow the ES points both horizontal and vertical.

Step Two: Process All

Select Process All at the bottom of the dialog box.

Step Three: Set Subbase Point Control

Now set a *Point Control* for the centerline point at the subbase so it will be vertically controlled by the subbase vertical alignment **Drive01Sub**.

From the InRoads *Roadway Designer* dialog, make sure that your Drive01 corridor is selected and select **Corridor>Point Controls** from the *Roadway Designer* menu. Set point **SG** (Bottom of Subgrade) *Mode* to **Vertical**, *Horizontal Alignment* to **Drive01CL**, and *Vertical Alignment* to **Drive01Sub** (Figure 17-101). Add the definition and close the dialog box.

Point Controls

Corridor: Drive01

Point: SG

Mode:
☐ Horizontal
☒ Vertical
☐ Both

Control Type: Alignment

Horizontal Alignment: Drive01CL

Vertical Alignment: Drive01Sub

Station Limits:
 Start: 0+00.00
 Stop: 0+51.00

Horizontal Offsets:
 Start: 0.0000
 Stop: 0.0000

Vertical Offsets:
 Start: 0.0000
 Stop: 0.0000

Priority: 1

Horizontal and Vertical Controls:

En...	Pri...	Name	Start Stati...	Stop Stati...	Mode	Type	Control
X	1	ES_L	0+09.92	0+50.00	Horizontal	Alignment	Drive01L
X	1	ES_R	0+09.92	0+50.00	Horizontal	Alignment	Drive01R
X	1	SG	0+00.00	0+51.00	Vertical	Alignment	Drive01CL:Dr...

Buttons: Add, Close, Change, Help, Delete

Figure 17-101: Add Point Control for subgrade alignment

🎵 The subgrade will now be controlled by the vertical subbase alignment.

Step Four: Set Target Aliasing

From the InRoads *Roadway Designer* dialog, select **Tools>Target Aliasing**. From the left

side of the list, highlight **Corridor – MainLine** and select **Add**. Repeat this process for the **Surface – Ground**. Highlight them both (Figure 17-102) once they are on the right side of the dialog (Aliases) and place a check in the *Use Closest* box. Select **OK**.

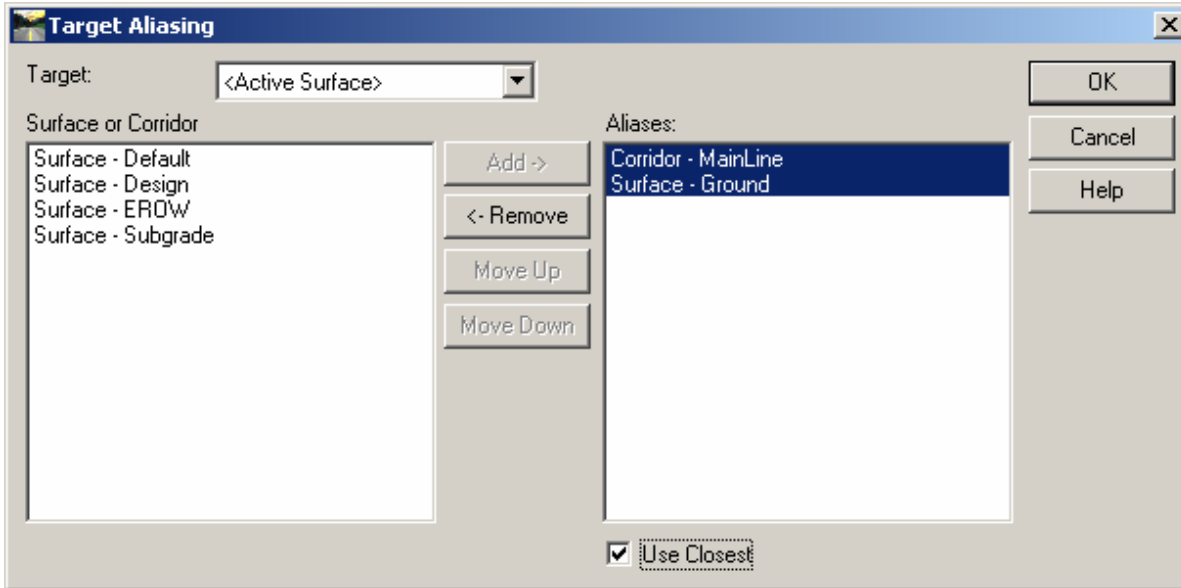


Figure 17-102: Target Aliasing dialog with MainLine and Ground selected

- ♪ The driveway surface will be modeled up to the previous mainline run or the existing ground, whichever is closest to the solution on a station per station basis.

CREATE COMBINED SURFACES

Overview

It is necessary to make a single surface out of the two corridor passes.

Step One: Process Corridors

On the bottom left corner of the *Roadway Designer*, switch the *Corridor* to **MainLine**, and select **Process All**.

Now switch the *Corridor* to **Drive01**, the *Target Aliasing* will be processed as it tries this corridor. Select **Process All**.

Step Two: Create Single Surface

From the InRoads *Roadway Designer* dialog, select **Corridor>Create Surface**. In the *Name* field, enter **Design**. In the *Create Surface from* portion of the dialog, highlight both corridors. Place a check in the *Add Transverse Features* and set the *Style* to **No Display** (Figure 17-103).

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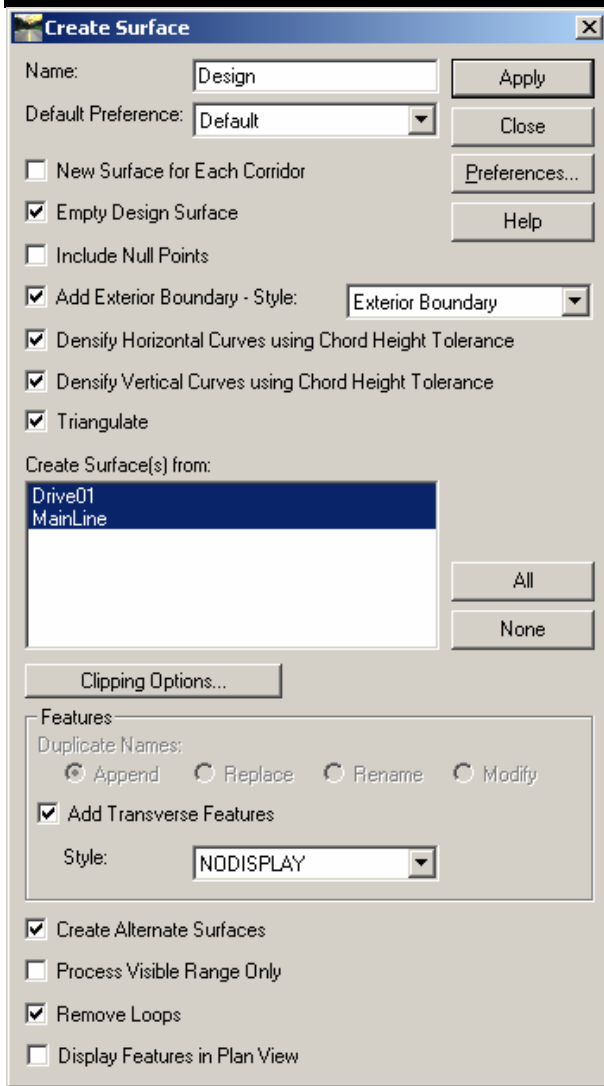


Figure 17-103: Create combined surface named Design

Before applying, select the *Clipping Options* button. Set the *Clipping Option* to **Clip End Conditions Only** (Figure 17-104) by just highlighting the default value (Clip All), select **OK**. Click **Apply** and close the *Create Surface* dialog box.

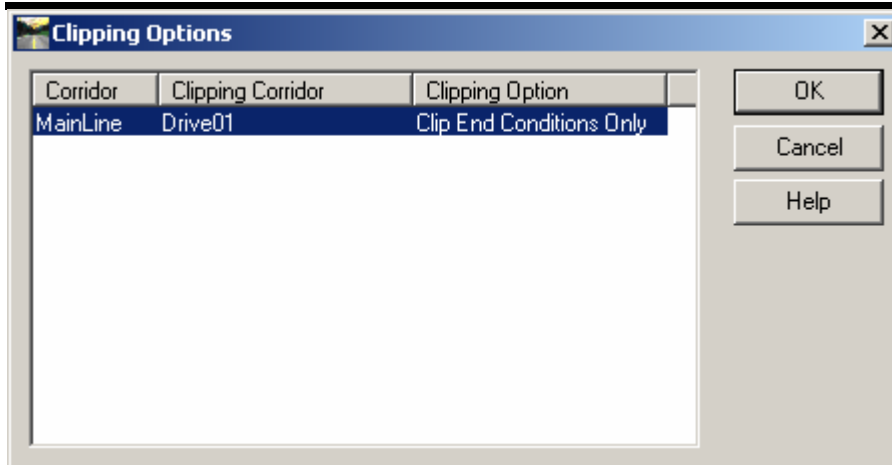


Figure 17-104: Set Clipping Options to Clip End Conditions Only

Step Three: Visualize Surface Triangles

Visualize the triangles in the plan view by selecting **Surface>View Surface>Triangles**. Select **Design** from the *Surface* pull down (Figure 17-105). Click **Apply**. In MicroStation, the triangles should be displayed (Figure 17-106).

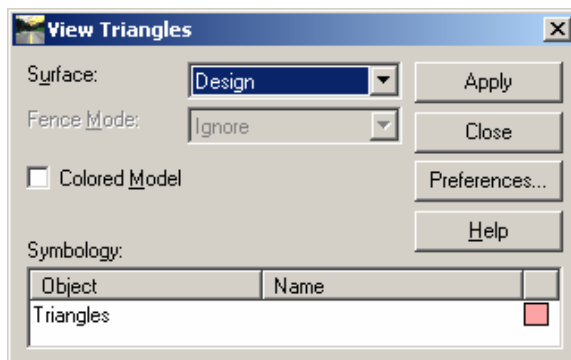


Figure 17-105: View Triangles for the Design Surface

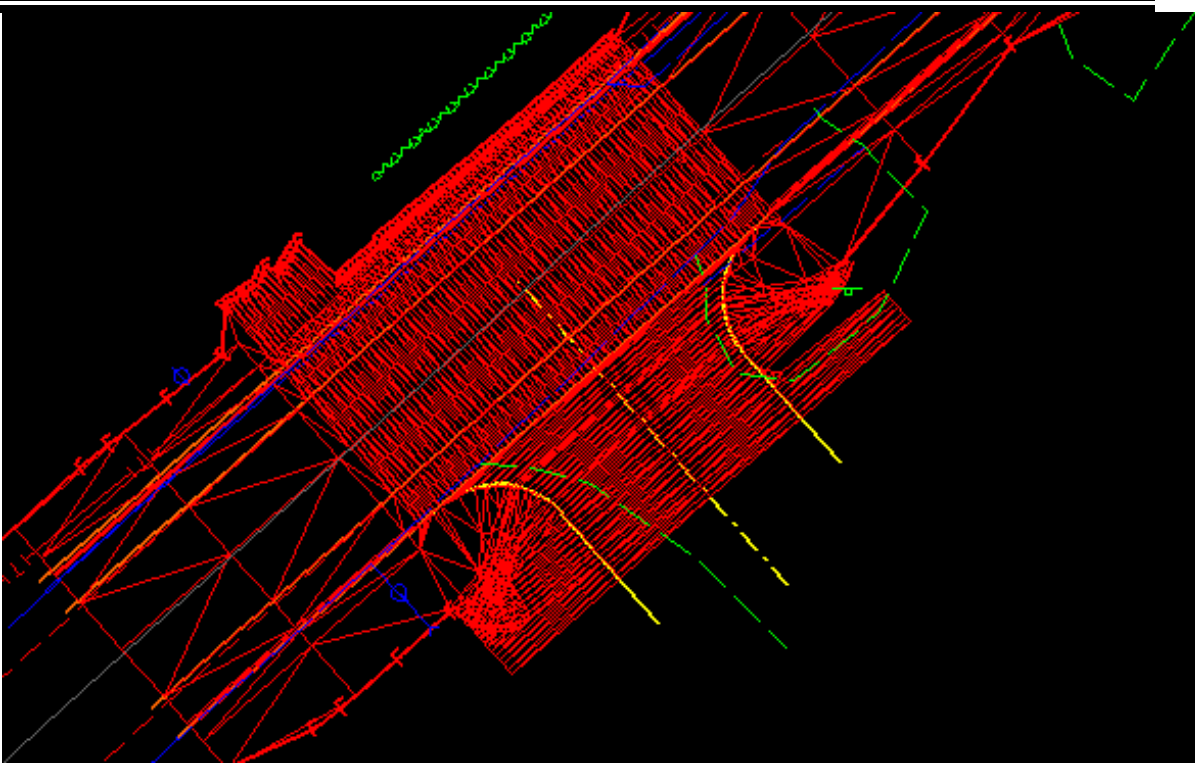


Figure 17-106: Triangles are displayed in MicroStation's view

A new complete surface is created out of both corridors. Volumetrics can now be obtained in the form of *End-Area Volume* component calculations as well as Cut/Fill Values.

Step Four: View Subgrade Triangles

Overview

This method will not show the subgrade lines on the MainLine cross sections unless the Subgrade surface is added as one of the surfaces displayed in the cross sections. The steps that follow will be necessary to add the driveway subgrade to the MainLine subgrade.

Part One: Delete Exterior

When the *Alternate Surfaces* are created for the **Subgrade**, an *Exterior* is created, but it doesn't encompass the whole surface, it only encompasses the last corridor that was processed. This "bug" has been reported to Bentley. Select **Surface>Edit Surface>Delete Feature**. Set the *Surface* to **Subgrade** and select the *Exterior* from the *Feature* list (Figure 17-107). Click **Apply**.

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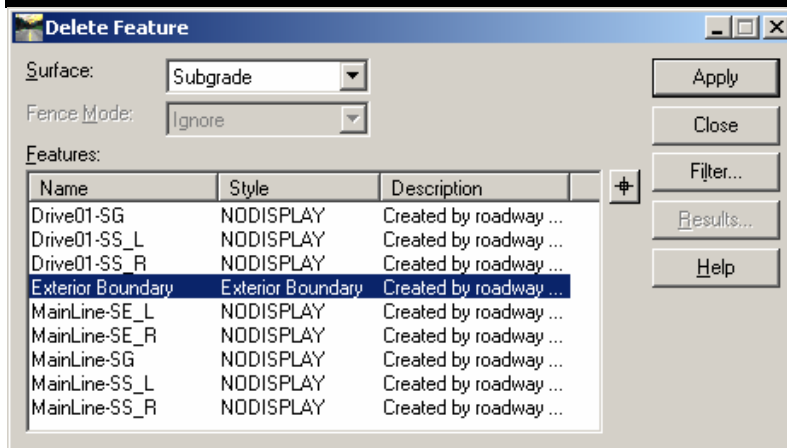


Figure 17-107: Select the Exterior feature and click Apply.

Part Two: Triangulate Subgrade

Select **Surface>Triangulate Surface...** from the InRoads menu. Re-triangulate the Subgrade Surface with a maximum leg length of 50' (Figure 17-108). Click **Apply**.

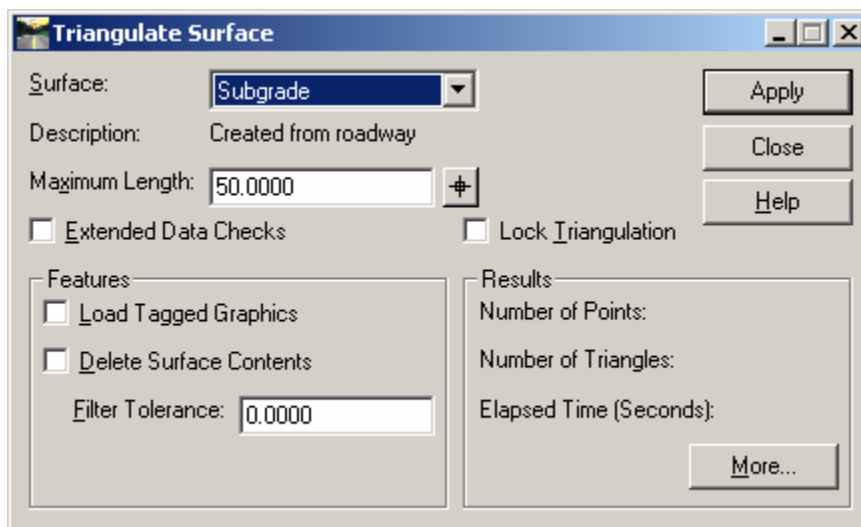


Figure 17-108: Triangulate the Subgrade Surface.

The results of the triangulation creates additional triangles connecting MainLine with the driveway that need to be deleted (Figure 17-109).

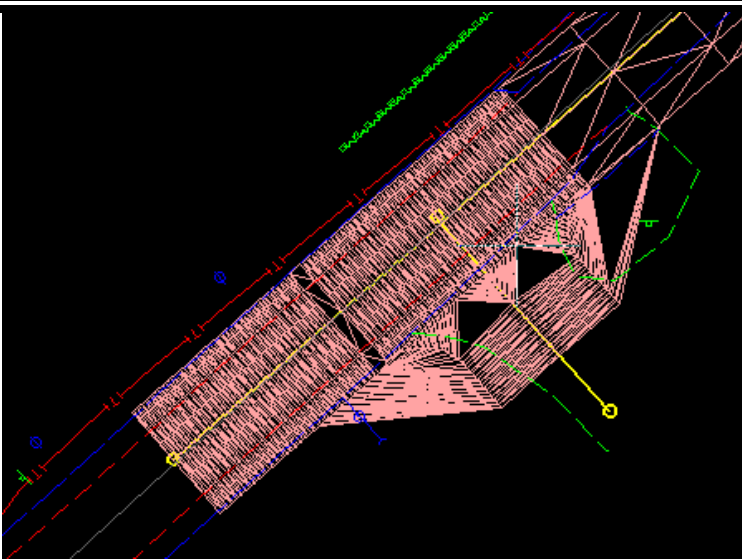


Figure 17-109: Results of new triangles.

Part Three: Clean-up Triangles

Select **Surface>Edit Surface>Delete Triangle** from the InRoads menu. Make sure that the **Subgrade** surface is active. The tool allows you to draw a line across the extra triangles. The results are shown in Figure 17-110.

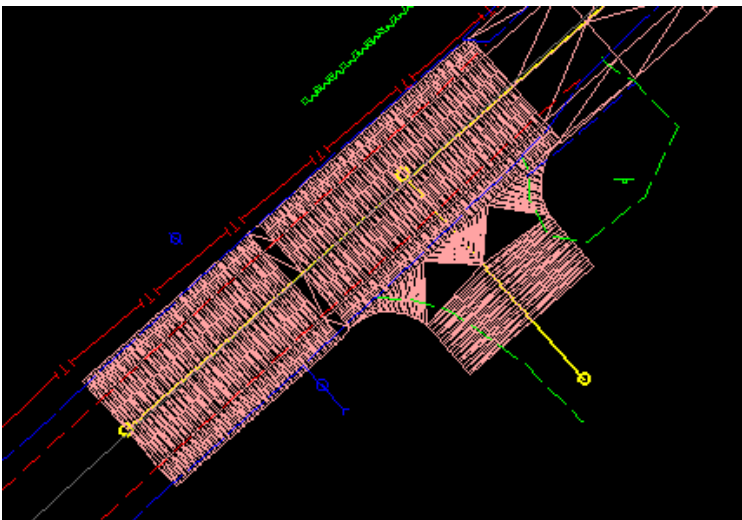


Figure 17-110: Results of cleaned-up triangles.

Part Four: Display the Perimeter

Select **Surface>View Surface>Perimeter** to display the Subgrade's new *Perimeter* (Figure 17-111).

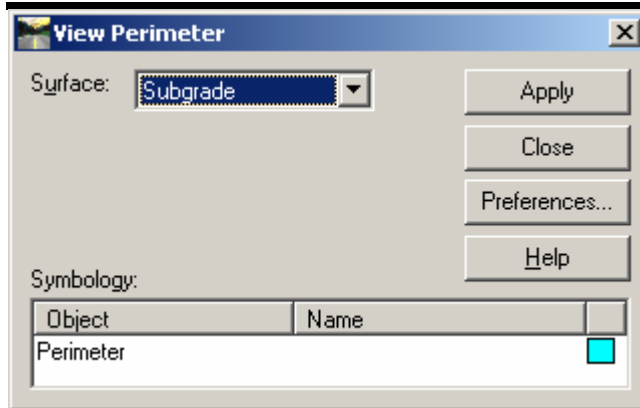


Figure 17-111: Display the new Perimeter around the triangles.

The perimeter will be cyan and encompass the triangles (Figure 17-112).

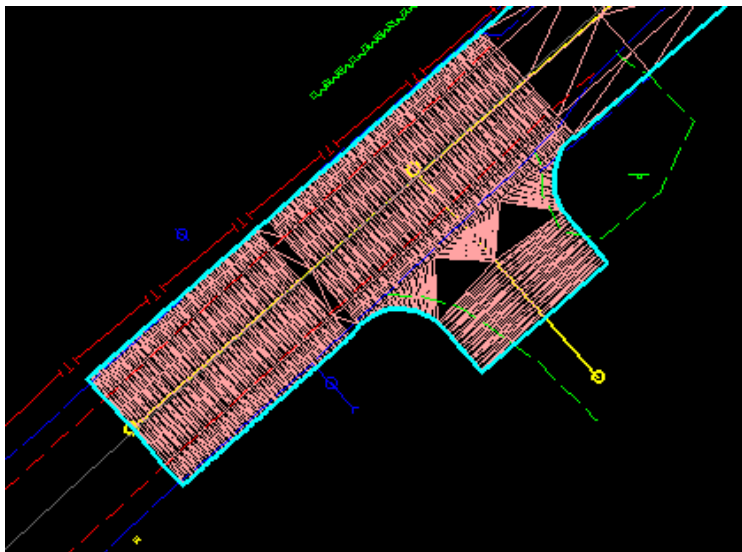


Figure 17-112: Perimeter displayed around the new triangles.

Part Five: Import Perimeter as Exterior

Select **File>Import>Surface** and setup the dialog to import the perimeter, as seen in Figure 17-113, as an *Exterior*. This will maintain the boundary of the cleaned-up triangles.

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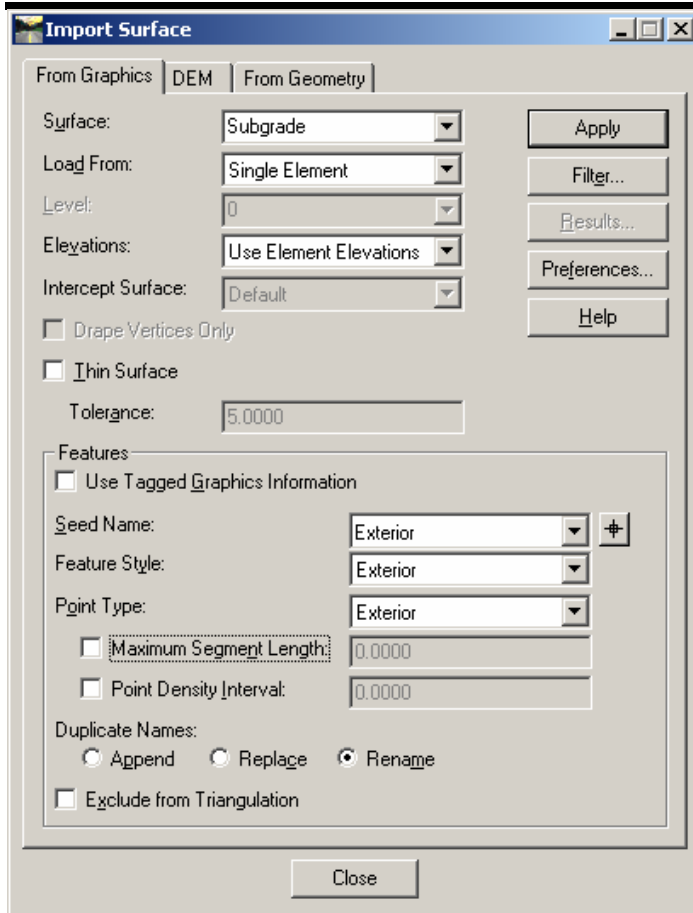


Figure 17-113: Import Surface dialog setup to import the Perimeter.

INTERSECTION DESIGN

INTERSECTION DESIGN

Prerequisites

**Final Alignment Design for each Corridor with Side Road
Alignment direction ending into the MainLine**

Corridors Develop w/“Typical” Templates

Superelevation Applied

MainLine Surface and Side Road Surface Created

Overview

The intent is to create intersections that transition smoothly together using the Roadway Designer. This method is an outline and is not intended to cover every unique situation out there.

The generation of this document was from viewing a video supplied by Bentley for designing intersections using the Roadway Designer. To view the video follow the link provided.

<\\Dot0dta1fscadd1\PCPIN1\msworksp\Documentation\MDOT\Training\video\InRoadsXMEditionIntersectionDesign.wmv>

Step One: Create a Working Drawing

Select **File>Make Sheetz** from the MicroStation main menu. Create a *No Prefix* drawing called either **Highway_working** or **Bridge_working** based on your workgroup.

✓ *Refer to page 1-18 for more information on using the Make Sheetz program.*

Select which reference files you want to display as well as the levels in each reference file. You may want to shut off the **Highway** or **Bridge** drawing if one has been created. The *features* for the MainLine and Side Road will be written to this drawing through InRoads. This is intended to be a working drawing and the final display and editing of the features will be in the dtm file and displayed in the **Highway.dgn** or **Bridge.dgn** file.

Step Two: Create and Display MainLine and Side Road Surface Features

🎵 This step assumes you have created a MainLine and Side Road corridor in the Roadway Designer, passed a template along each, assigned superelevation and applied shoulder rollover locks.

Select **Modeler>Roadway Designer** from the InRoads main menu. Select **Corridor>Create Surface** from the Roadway Designer. Turn on **New Surface for Each Corridor**, highlight your mainline and side road corridors in the *Create Surface(s) from*,

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turn on **Add Transverse Features** and pick the *Style: NODISPLAY* and turn off **Create Alternate Surfaces** (Figure 17-114).

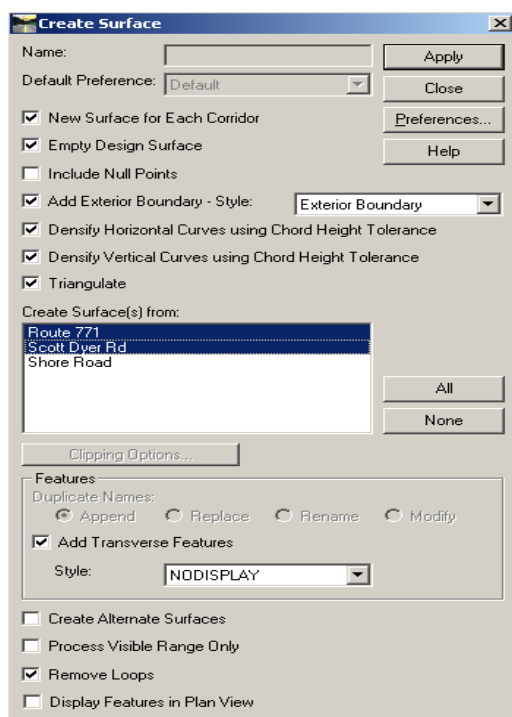


Figure 17-114: Create Surface

Close the *Create Surface* dialog and minimize the *Roadway Designer*.

Set the *Filter* to **Plan Display** and turn on the filter lock from the locks toolbar. Select **Surface>View Surface>Features...** from the InRoads main menu. Select the **MainLine** surface and click **Apply**. Select the **Side Road** surface and click **Apply**. Fit the view to see your graphics (Figure 17-115). Also display your mainline and side road alignments.

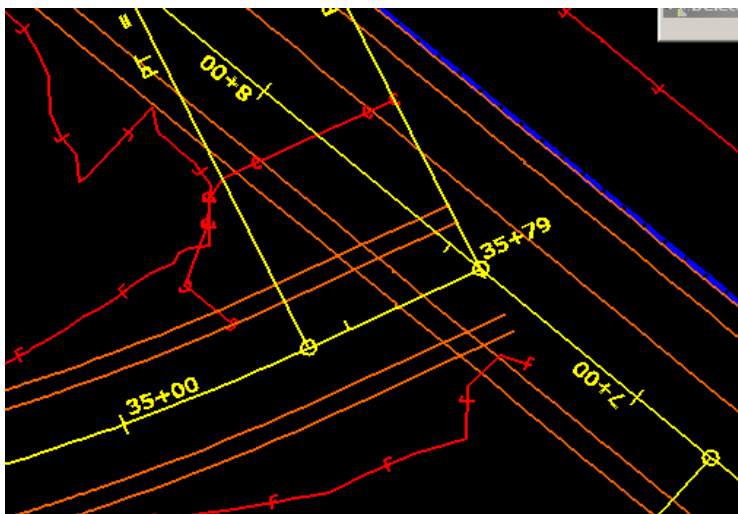


Figure 17-115: Mainline and Side Road Display

Step Three: Using the Multi-Center Curve tool and Review

✓ Refer to 33-10 to utilize AutoTrack to determine turning movement radii.

Part One: Creating Multicenter Curve

Select **Geometry>Utilities>Multicenter Curve** from the InRoads main menu (Figure 17-116). Use of this tool will allow for generating a horizontal and vertical alignment from the mainline and side road surfaces.

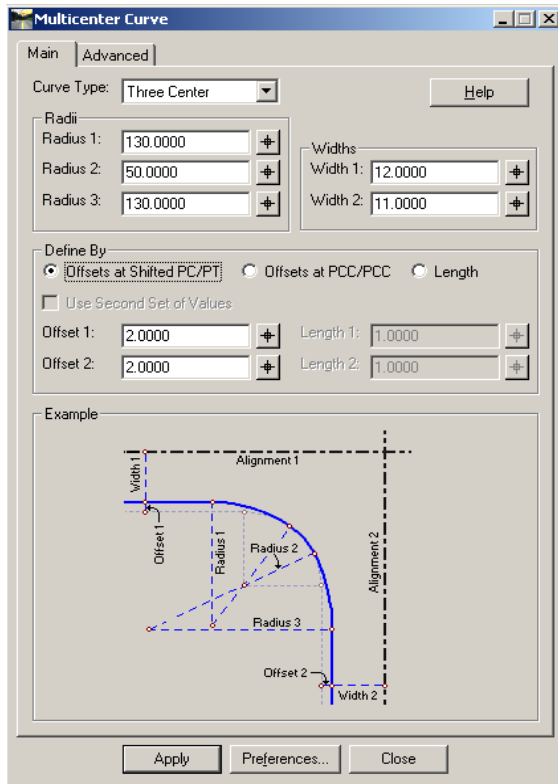


Figure 17-116: Multicenter Curve

In this example we will use *Curve Type*: **Three Center** for one side of the intersection.

🎵 For more information about this tool refer to the InRoads Help button within this dialog.

On the *Main* tab set your desired **Radii** in the three radius boxes, for the **Widths** you will want to set the travelway width for the mainline in **Width 1** and your side road travelway width in **Width 2** (Figure 17-117). Refer to the **Example** at the bottom of the dialog for a better understanding of the width relationship to centerline.

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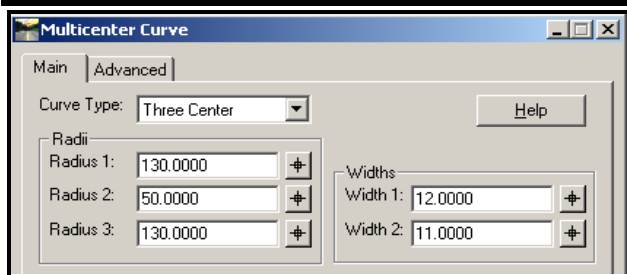


Figure 17-117: Multicenter Curve Radius and Width

Select the *Advanced* tab and assign an **Alignment Name:**, and pick the **Style:** **D_Roadway_Centerline** (Figure 17-118).

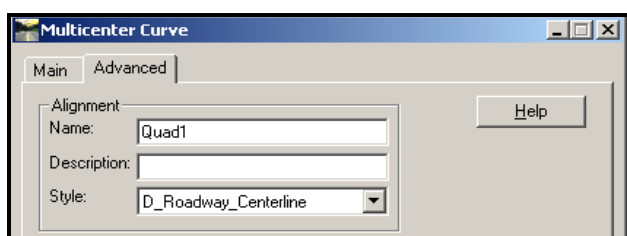


Figure 17-118: Multicenter Curve Alignment Name

Turn on **Create Vertical Alignment** and for the *First Selected Alignment* set the surface to your mainline surface. Set the *Second Selected Alignment* to the side road surface as shown below (Figure 17-119).

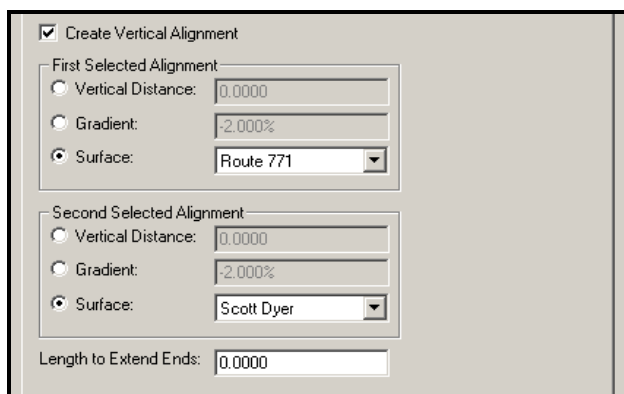


Figure 17-119: Multicenter Curve Create Vertical Alignment

Click **Apply**. You will be prompted to locate the first alignment. Select graphically with a left mouse button the mainline alignment.

Next you will be prompted to identify the second alignment, select the side road alignment with a left mouse button.

Then you will be asked to identify the quadrant for return, send a left mouse button click to the desired quadrant (Figure 17-120).

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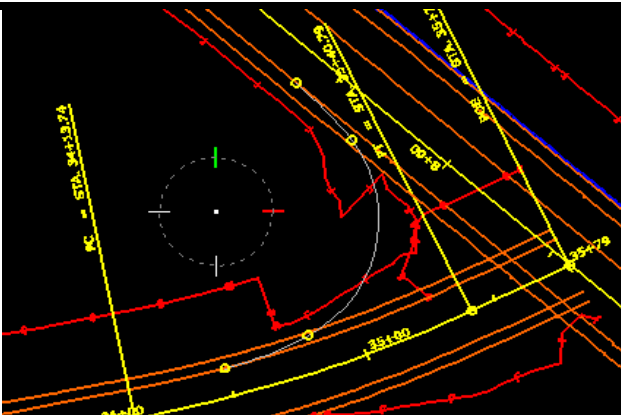


Figure 17-120: Temporary display of Alignment

If you like the alignment then left mouse button click to the view to accept the alignment (Figure 17-121).

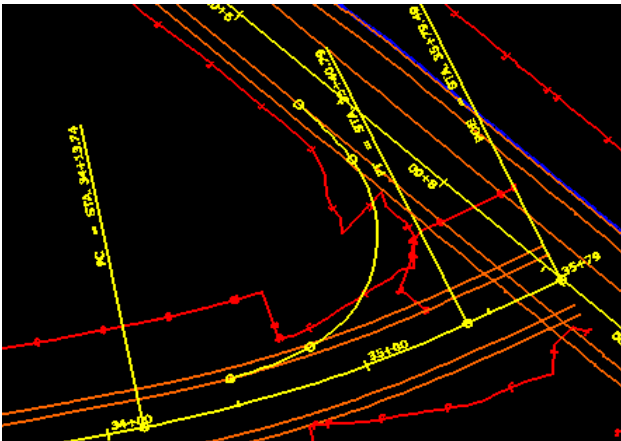
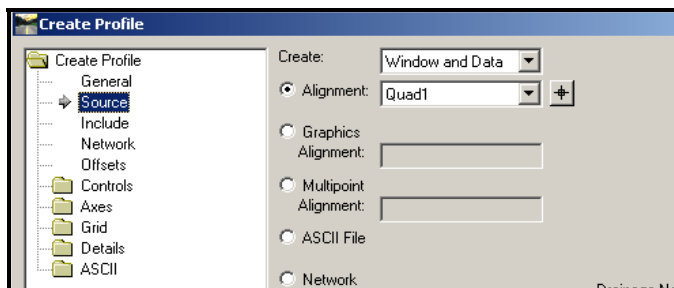


Figure 17-121: Accepting the Alignment

The new alignment ties into the edges of travelway for each roadway surface. Follow the same routine to develop the radius for the other side choosing to do a one, two or three center curve type.

Part Two: Review Vertical Alignment

Select **Evaluation>Profile>Create Profile** from the InRoads main menu. In the *Source* area set the alignment to the edge alignment generated using the Multicenter tool (Figure 17-122).



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Figure 17-122: Create Profile Source Alignment

Set any style that is not the color yellow to the two surfaces (Mainline and side road surfaces) listed in the *General* section by highlighting the surface and selecting *Properties* (Figure 17-123).

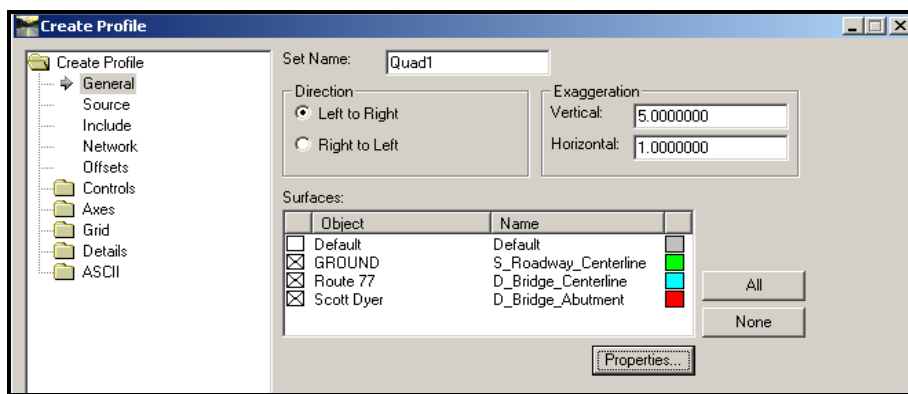


Figure 17-123: Create Profile Quad 1

Click **Apply** and send a left mouse button to the view window to see the profile. Select **Geometry>View Geometry>Active Vertical** to see how the Multicenter Curve tool built the vertical alignment (Figure 17-124).

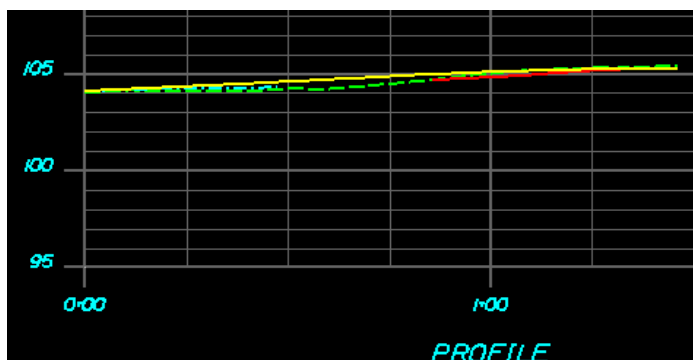


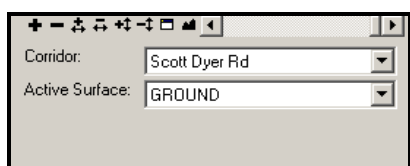
Figure 17-124: Profile Display

If you want to adjust the vertical alignment then refer to the geometry tools to edit or recreate the vertical alignment.

Step Four: Point Control for Edge of Travelways

Now that we have alignments for each edge of travelway for the side road we can control our widths of travelway with the point controls within the Roadway Designer.

Select **Modeler>Roadway Designer** from the InRoads main menu. Pick your side road *Corridor:* and set the *Active Surface:* to **Ground** (Figure 17-125).



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Figure 17-125: Setting Corridor and Active Surface

Select **Corridor>Point Controls** from the Roadway Designer main menu. Set *Point:* to **CE_L**, change the *Mode* to **Both**, set the *Control Type:* to **Alignment**, select the **Horizontal and Vertical Alignment** that was developed for the left side of the side road (if you can't remember the name hold down the **Ctrl** key and use the selection button to the right of the Horizontal Alignment drop down box to graphically select it in the MicroStation view window.) and place a check mark in the **Use as Secondary Alignment** (Figure 17-126).

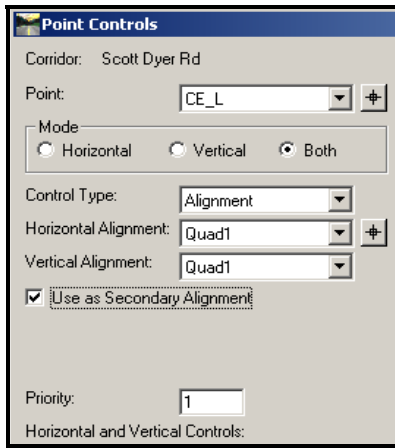


Figure 17-126: Point Controls Travelway Edge

For the *Station Limits* the **Start:** station should be the first point of the Quad1 alignment intersecting the travelway edge of the side road and the **Stop:** should be the intersection point of the Quad1 alignment and the shoulder edge of the Mainline or the last point that can be seen perpendicular to the side road alignment (Figure 17-127).

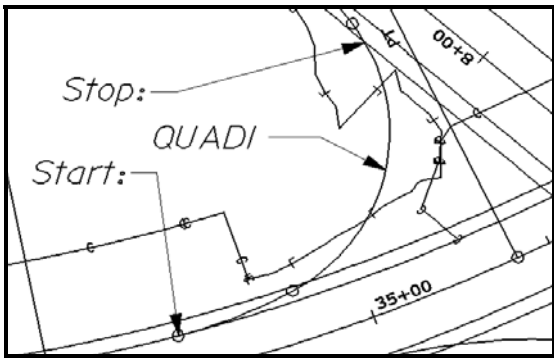


Figure 17-127: Station Limits Start and Stop

Set the *Station Limits* by holding down the **Ctrl** key and use the selection button to the right of the start and stop station to pick the limits graphically (Figure 17-128).

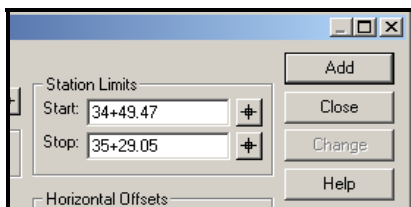


Figure 17-128: Point Controls Start and Stop

Click the **Add** button to populate the **Horizontal and Vertical Controls** area of the dialog (Figure 17-129).

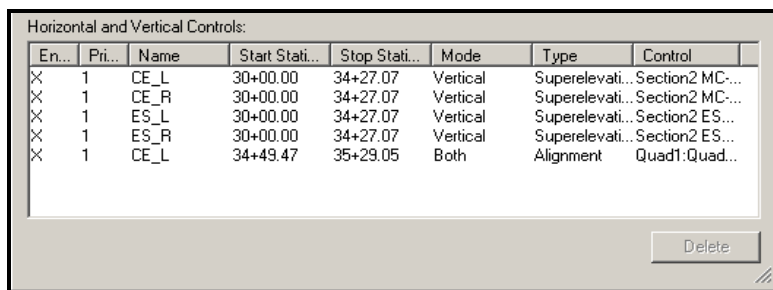


Figure 17-129: Horizontal and Vertical Controls

Repeat this process for the right travelway edge (**CE_R**) click **Add** and **Close** dialog. After setting the right side you should see the secondary alignments displayed within the Roadway Designer (Figure 17-130). By using secondary alignments to control the travelway edge this allows the shoulders and end conditions to come off perpendicular to the secondary alignment for better triangulation.

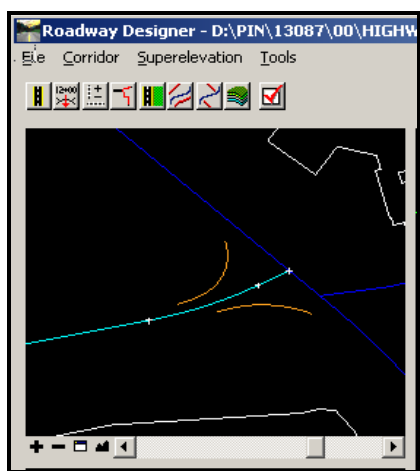


Figure 17-130: Roadway Designer Plan View

Step Five: Adjust Template drops for Side Road

Template Drops and Edits

At this point the side road will need to intercept the edge of shoulder of the mainline. This is done by adding additional template drops and doing additional point controls.

Select **Corridor>Template Drops** from the Roadway Designer main menu. In the *Current Template Drops*: highlight the template drop (if there are multiple drops for the side road then select the last station drop given), set the *Station*: to the closest station intercepting the edge of shoulder of the mainline looking up station (in this case it is the last station given for the point control for the **CE_L** which is 35+29.05) and round it back a bit to 35+29.00 for now. Set the *Interval*: to 2 and click the **Copy** button (Figure 17-131).

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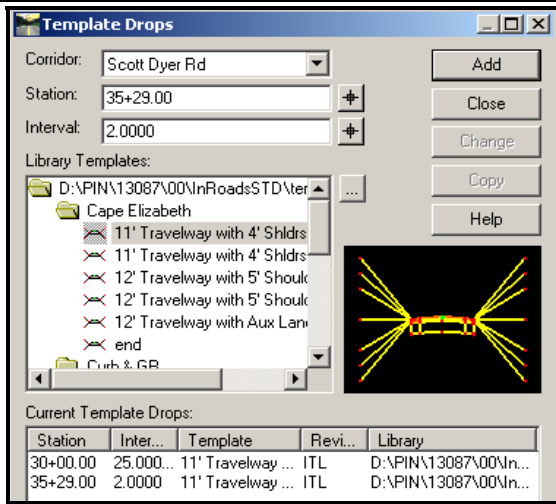


Figure 17-131: Template Drops Copy1

Highlight the new template drop and select **Edit** (Figure 17-132).

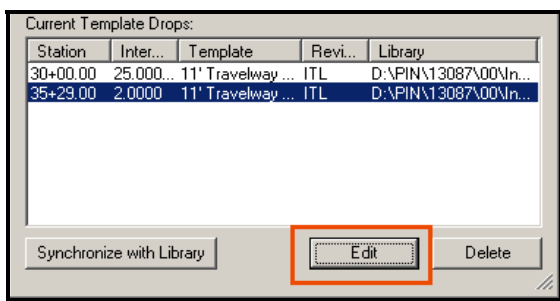


Figure 17-132: Template Drops Edit1

Delete the left end conditions and shoulder from the template drop and click **OK** (Figure 17-133).

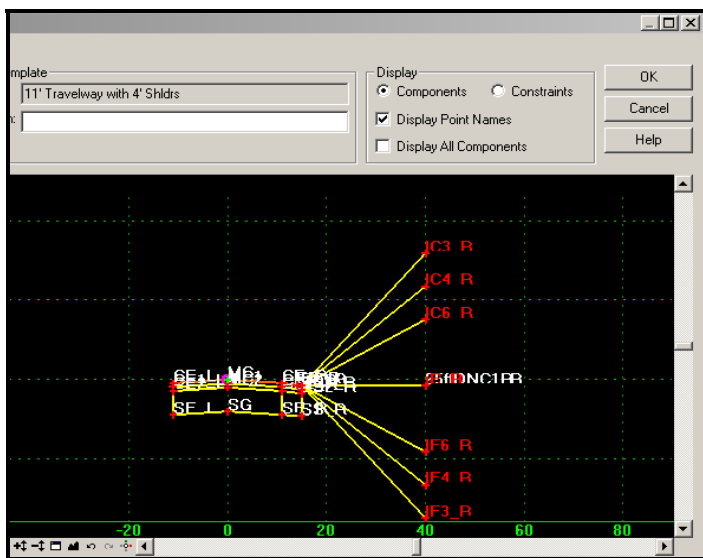


Figure 17-133: Template Edit1

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Highlight the edited template drop, set the *Station:* to the intersecting point of the side road alignment and the edge of shoulder of the mainline (hold the **ctrl** key and pick the selection tool to graphically select the intersection point to populate the station) and then back it off an inch plus/minus. Set the *Interval:* to 2 and click the **Copy** button (Figure 17-134).

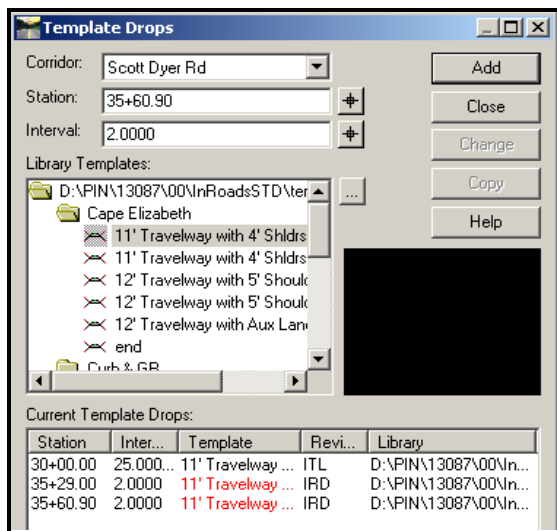


Figure 17-134: Template Drops Copy2

Highlight the new template drop and select **Edit** (Figure 17-135).

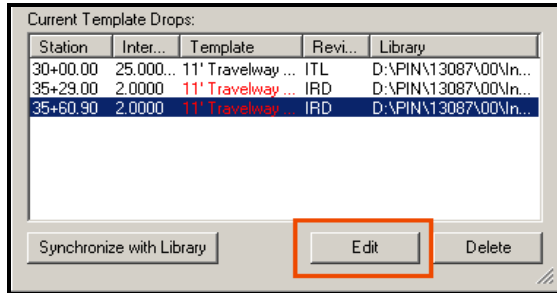


Figure 17-135: Template Drops Edit2

Delete the left travelway edge and sub points from the template drop and click **OK** (Figure 17-136).

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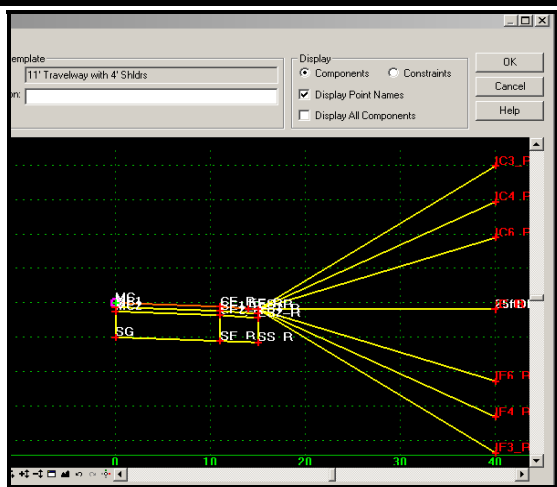


Figure 17-136: Template Edit2

Close the Template Drops dialog.

Point Controls for Edited Template Drops

Select **Corridor>Point Controls** from the Roadway Designer main menu. Set *Point:* to **CE_L**, change the *Mode* to **Both**, set the *Control Type:* to **Corridor Point**, select the Mainline as the *Corridor:* and set the *Reference Point:* to the edge of shoulder point name from the Mainline (**ES_L**) (Figure 17-137).

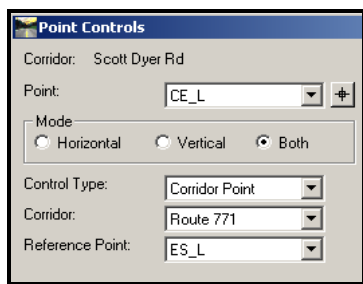


Figure 17-137: Point Controls Edge of Travelway

For the *Station Limits* the *Start:* station should be the same as the first edited station drop and the *Stop:* station should be the last station drop. In the *Horizontal Offsets* set the *Start:* and *Stop:* to **0.1000** (Figure 17-138).

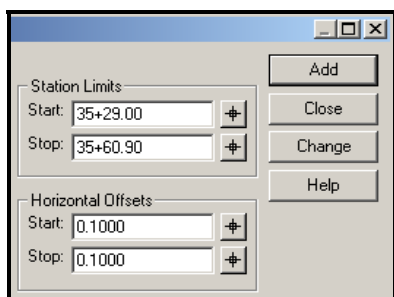


Figure 17-138: Point Controls Station Limits

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Click the **Add** button. If some point controls turn orange then that means there is a conflict with the point controls set (Figure 17-139).

En...	Pri...	Name	Start Stati...	Stop Stati...	Mode	Type	Control
X	1	CE_L	30+00.00	34+27.07	Vertical	Superelevati...	Section2 MC...
X	1	CE_R	30+00.00	34+27.07	Vertical	Superelevati...	Section2 MC...
X	1	ES_L	30+00.00	34+27.07	Vertical	Superelevati...	Section2 ES...
X	1	ES_R	30+00.00	34+27.07	Vertical	Superelevati...	Section2 ES...
X	1	CE_L	34+49.47	35+29.05	Both	Alignment	Quad1:Quad...
X	1	CE_R	34+86.88	35+79.49	Both	Alignment	Quad2:Quad...
X	1	CE_L	35+29.00	35+60.90	Both	Corridor Poin...	Route 771:E...

Figure 17-139: Point Controls Conflict

The initial point control by alignment has a stop station value greater than the start station value of the corridor point control just provided. Highlight the first point control for **CE_L** and adjust the *Stop:* station to match the *Start:* station value and click **Change** (Figure 17-140).

En...	Pri...	Name	Start Stati...	Stop Stati...	Mode	Type	Control
X	1	CE_L	30+00.00	34+27.07	Vertical	Superelevati...	Section2 MC...
X	1	CE_R	30+00.00	34+27.07	Vertical	Superelevati...	Section2 MC...
X	1	ES_L	30+00.00	34+27.07	Vertical	Superelevati...	Section2 ES...
X	1	ES_R	30+00.00	34+27.07	Vertical	Superelevati...	Section2 ES...
X	1	CE_R	34+86.88	35+79.49	Both	Alignment	Quad2:Quad...
X	1	CE_L	35+29.00	35+60.90	Both	Corridor Poin...	Route 771:E...
X	1	CE_L	34+49.47	35+29.00	Both	Alignment	Quad1:Quad...

Figure 17-140: Point Controls Conflict Resolved

You will notice the color going back to black and the point control dropping to the bottom indicating the last edit.

Do the same process for the **MC** point with the same **Mode:**, **Control Type: Corridor** and **Reference Point:**. Set the *Station Limits* start station to match the last template drop in the series of drops for the side road, stop station at the farthest point of intersection for the travelway edge and edge of shoulder on the mainline and supply a **0.100 Horizontal Offsets** for both the start and stop (Figure 17-141).

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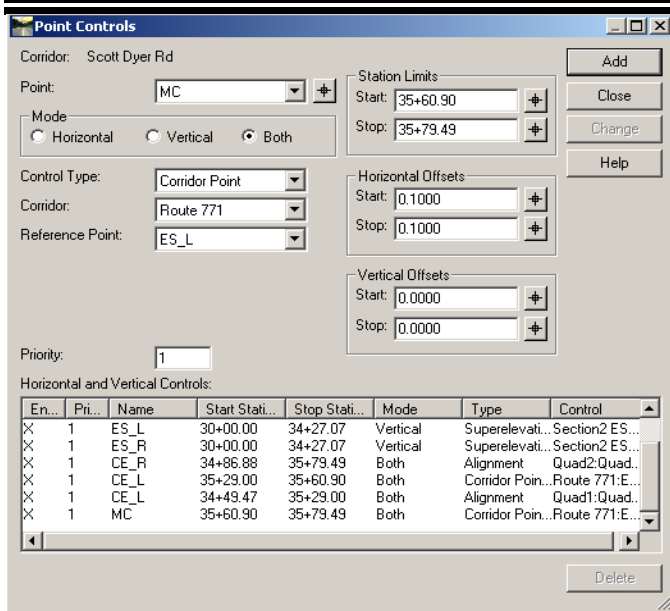


Figure 17-141: Point Controls for MC

Click **Add** to populate the **Horizontal and Vertical Controls** and **Close** the dialog.

In the Roadway Designer and click the **Process All** and view the plan view of the Roadway Designer to see how the interfacing looks (Figure 17-142).

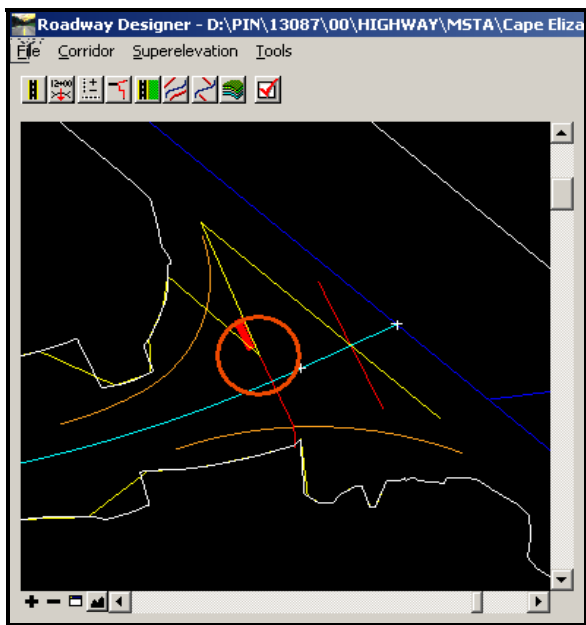


Figure 17-142: Roadway Designer Plan Review Error

In this case there ended up being a spike in the station drops due to the horizontal offset that was applied when controlling the **CE_L** point and maintaining the integrity of the mainline edge of shoulder. To correct this go back to the template drop that matched the original point control at station 35+29.00 and adjust it back by the 0.100 provided for the **Horizontal Offsets** (Figure 17-143).

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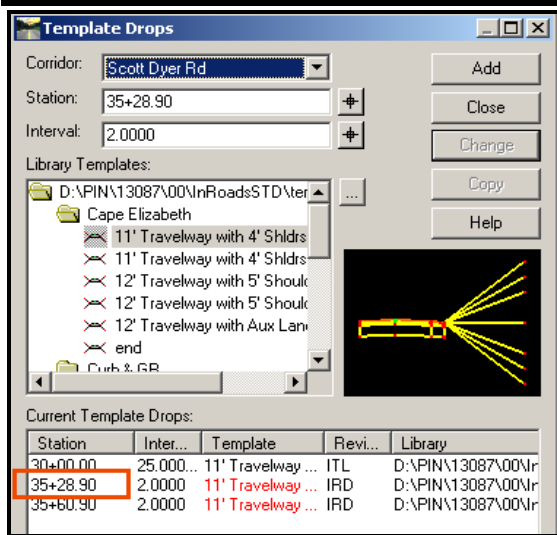


Figure 17-143: Template Adjustment

Next reopen the Point Controls dialog and adjust the *Stop Station* value for the **CE_L** point that is being controlled by an **Alignment** to match the template drop station (Figure 17-144).

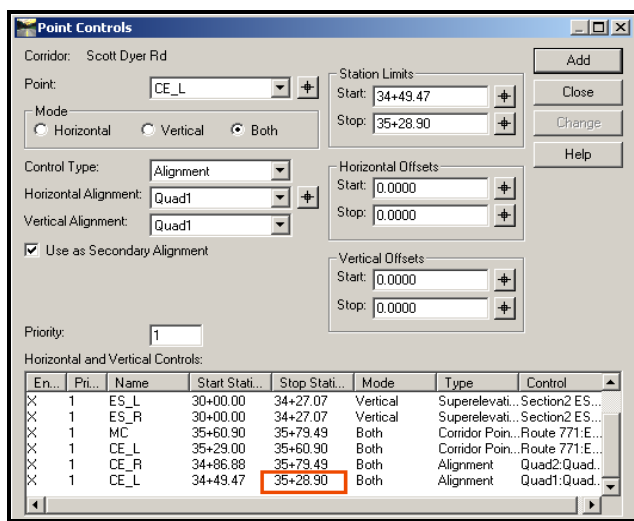


Figure 17-144: Point Controls Adjustment

Close the Point Controls dialog and do another **Process All** within the Roadway Designer and review the plan view again (Figure 17-145).

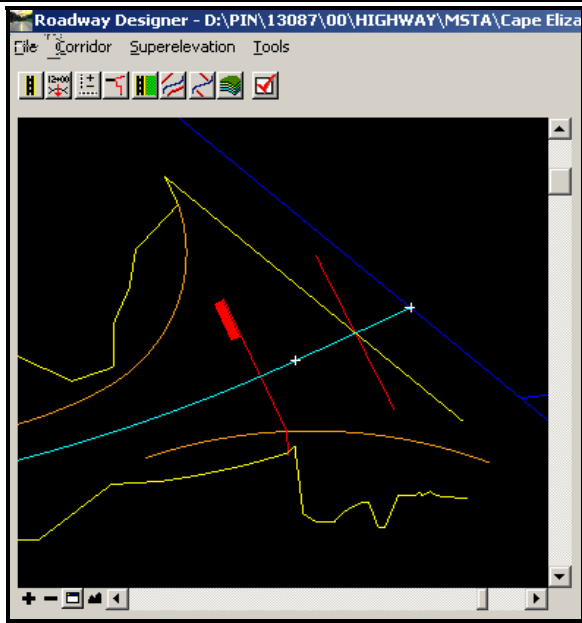


Figure 17-145: Roadway Design Plan Review Fixed

Notice the spike is now gone.

Step Six: Target Alias

Select **Tools>Target Alias** from the Roadway Designer main menu. **Add** the mainline corridor and the existing ground surface to the *Aliases:* area of the dialog. Move the corridor to the top if necessary (Figure 17-146).

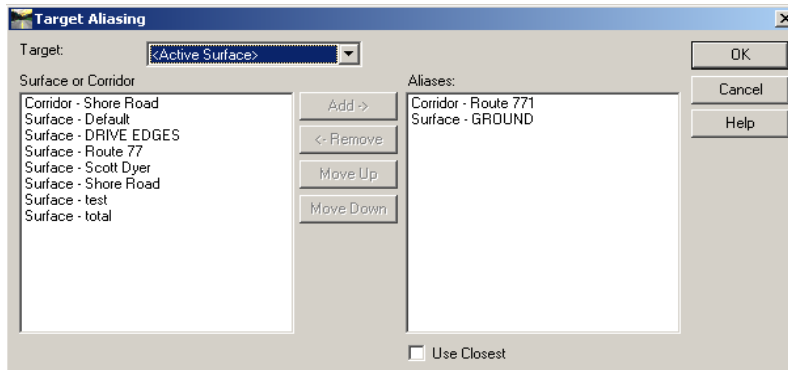


Figure 17-146: Target Aliasing

Click **OK** to close the dialog.

Step Seven: Create Combined Surface

Select **Corridor>Create Surface** from the Roadway Designer main menu. Set the *Name:* to **Design**. Down in the middle of the dialog, click on the **Clipping Options** button to review the settings (Figure 17-147).

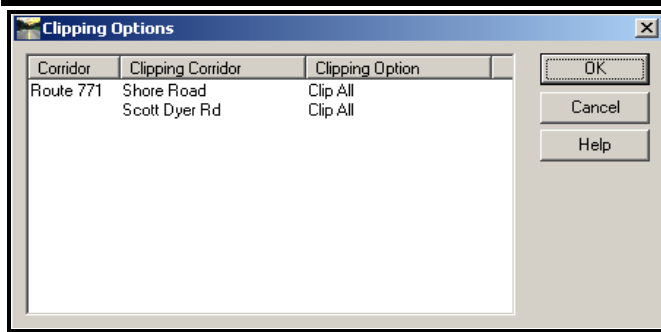


Figure 17-147: Clipping Options

This should be set to **Clip All**. To change it just simply left click the desired row to change in the location of the **Clipping Options** column. Click **OK** to close the dialog box.

Highlight the desired surfaces in the *Create Surface(s) from:* that you want to create the combined surface from (Figure 17-148).

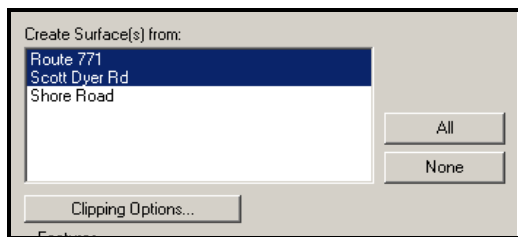


Figure 17-148: Create Surface(s) from

Place a check mark in the *Add Transverse Features* and pick **NODISPLAY** for the *Style:* (Figure 17-149).

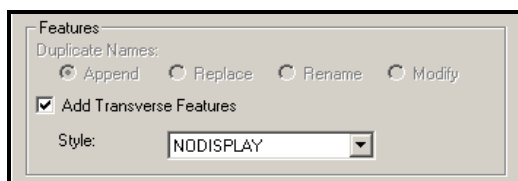


Figure 17-149: Create Surface Transverse Features

You may or may not want to **Create Alternate Surfaces** but if you do then place a check next to this area of the dialog box. The overall look of the Create Surface dialog should look like this (Figure 17-150).

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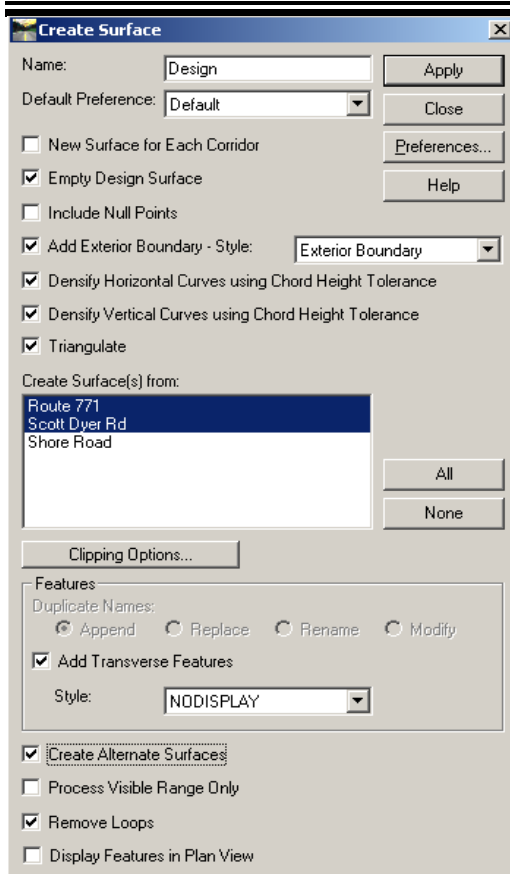


Figure 17-150: Create Surface

Click **Apply** and allow for the processing to finish before closing the dialog. **Close** the Roadway Designer and save your *.ird.

Step Eight: View Features

Select **Surface>View Surface>Features** from the InRoads main menu. Set the *Surface:* to **Design** and click on the **Filter** button. Set the filter to **Plan Display** and click **OK**. (Figure 17-151).

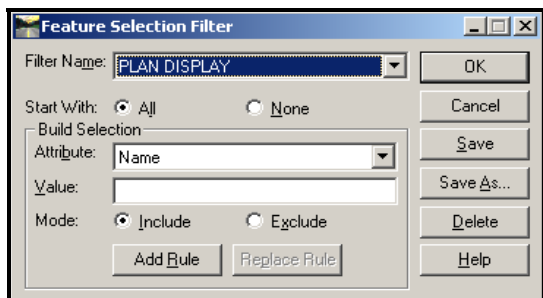


Figure 17-151: Feature Selection Filter

Verify that the **Feature Filter Lock** is on in the Locks toolbar and click **Apply** to display the features of the combined surface (Figure 17-152). Close the dialog.

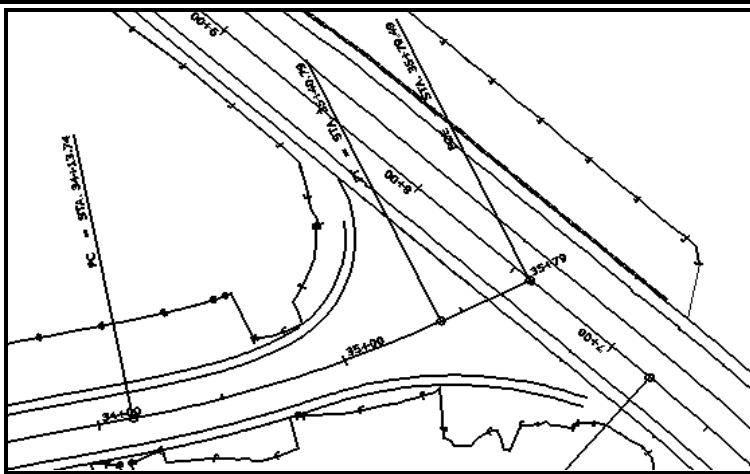


Figure 17-152: Features Display in Combined Surface

As you can see there will still need to be some clean up of the features coming into the edges of the mainline. This could be done using the surface editing and design tools within InRoads or drawing MicroStation lines and importing them to the combined surface.

Step Nine: View Triangles

To view the triangles select **Surface>View Surface>Triangles** from the InRoads main menu. Set your surface to design, select the **Preferences** button and load the **Proposed** preference. Click **Apply** to view the triangles (Figure 17-153).

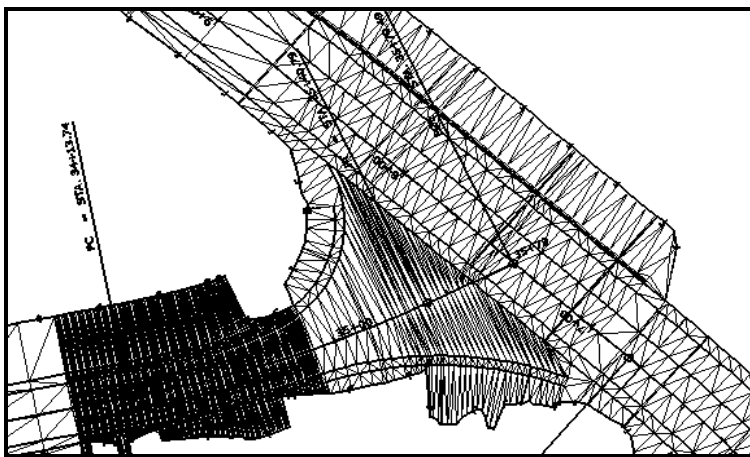


Figure 17-153: Triangle Display

The display of the triangles shows how the side road interfaces to the edge of shoulder of the mainline and also how they turn on the secondary alignments of the travelway edge to create a more accurate model.

Step Ten: Rendering Triangles (Optional)

To render the triangles select the lightning bolt (Change View Display) within the view control icons at the bottom of View 1 (Figure 17-154).

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Figure 17-154: Change View Display

Turn on **Graphic Acceleration** and change the *Display Mode:* to **Smooth** (Figure 17-155).

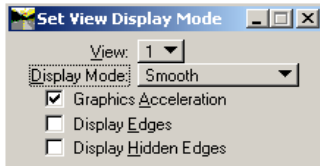


Figure 17-155: Set View Display Mode

This will render the view.

- ♪ You may need to turn the level off for the Exterior. Turn off the level named (4) in the earlier version of the xin or level name (Exterior) in the latest xin file.

Use the Rotate View tool, set to **Dynamic** and with **Dynamic Display** checked on (Figure 17-156), place a tentative snap near the intersection and accept (left button) to rotate the triangles around viewing the interfacing into the mainline (Figure 17-157).

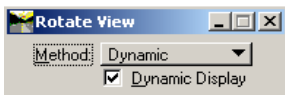


Figure 17-156: Rotate View

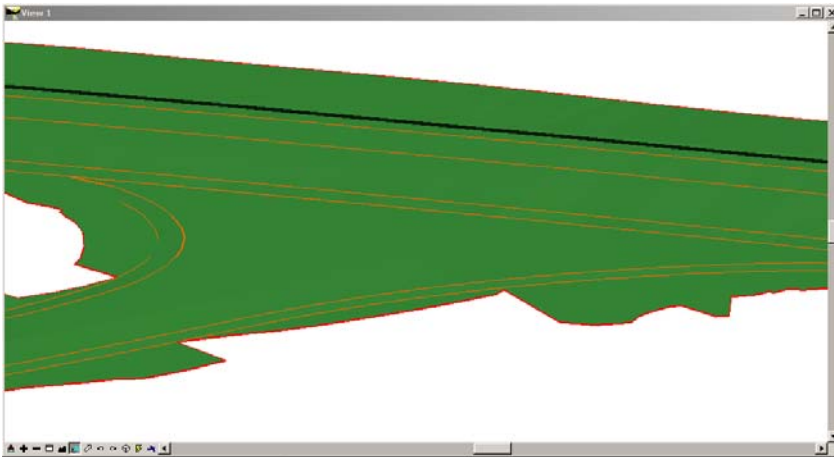


Figure 17-157: Rendering Intersection

Select the Rotate View tool again and change *Method:* to **Top** to set the view back to normal. Reselect the **Change View Display** icon, uncheck **Graphic Acceleration** and set the *Mode:* to **Wireframe** to remove the rendering.